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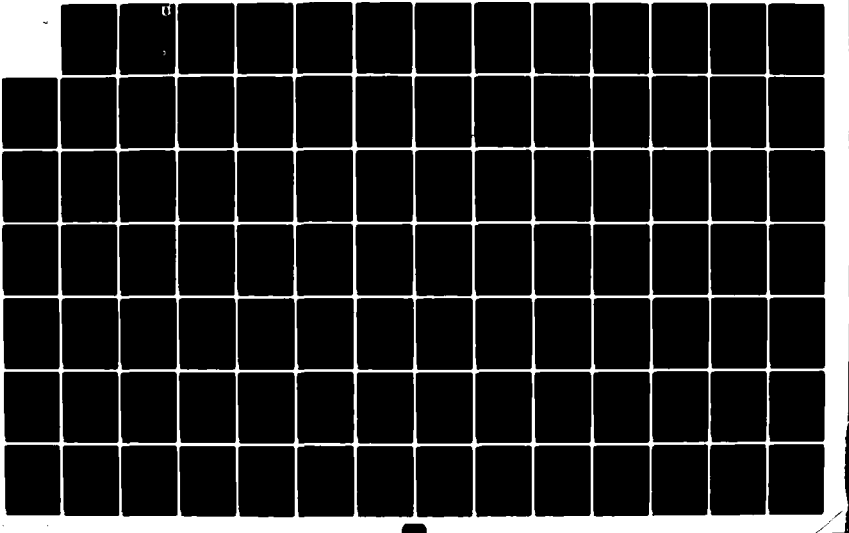

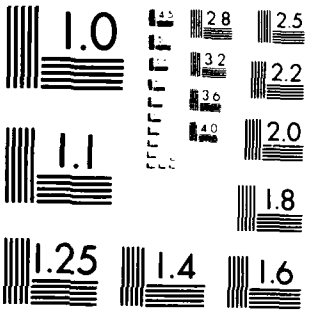

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HANDBOOK FOR EVALUATION AND LIFE CYCLE PLANNING FOR SOFTWARE

Volume II: Contract Management

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1 February 1983

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Prepared for

ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
DEPUTY FOR ACQUISITION LOGISTICS
AND TECHNICAL OPERATIONS
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This document is Volume 2 of the Handbook for Evaluation and Life Cycle Planning for Software (HELPS). This volume provides the user with comprehensive checklists and guides to ensure that the software performance requirements dictated in the System Specification (A-SPEC) and the tasks in the Statement of Work (SOW), have been functionally and quantitatively defined. It also defines the standards and responsibilities of the contractor in delivering a quality software product. It includes sections on source selection, evaluation criteria, and the Source Selection Evaluation Board.

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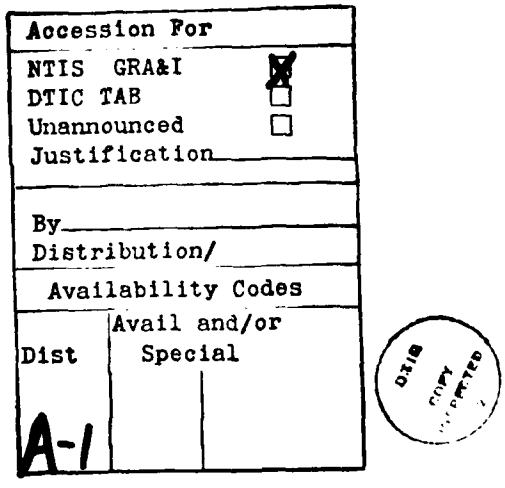
Cont. of Block 18:

A-SPEC	SOW	IFPP	CDRL
HOL	CPDP	SQAP	SOFTWARE
CPCI	CPC	MODULE	TDD
FIRMWARE	UTILITY	WAIVERS	TEST
PQT	FQT	MEMORY	CPIN
ATLAS	REVIEWS	DOCUMENTATION	DESIGN
SUPPORT	DATA	RESOURCES	DEVELOPMENT
MAINTENANCE	CONFIGURATION	LIBRARY	CERTIFICATION
PDR	CDR	SIMULATION	ANALYSIS
OFF-THE-SHELF			

ACKNOWLEDGEMENTS

This book was developed to assist ESD computer resource personnel in the performance of their daily acquisition related activities. It contains a collection of available software related guidelines, checklists, and standard verbage associated with AF 800 series software and computer resources life cycle activities. The activities provided came from many different sources, e.g. guidebooks, Computer Resource Acquisition Management System (CRAMS), MITRE studies, information exchanges with other AFSC product divisions, and most importantly, from experienced software acquisition managers here at ESD.



HANDBOOK FOR EVALUATION AND LIFE CYCLE PLANNING FOR SOFTWARE

VOLUME II: CONTRACT MANAGEMENT

TABLE OF CONTENTS

	PAGE
Acknowledgements	iii
List of Figures	vii
List of Tables	viii
Section 1: Systems Specification (A-Spec)	1
Section 2: Statement of Work (SOW)	11
Section 3: Instructions for Preparation of Proposal (IFPP)	20
Section 4: Contract Data Requirements List (CDRL)	29
Section 5: Development of Source Selection Plan (SSP)	46
Section 6: Evaluation Criteria	47
Section 7: Source Selection Evaluation Board	56
Section 8: Computer Program Development Plan	57
Section 9: Software Quality Assurance	70
Section 10: Computer Program Development Capability/Capacity Review (Pre-Award Survey)	88
Section 11: High Order Language Waivers	114
List of References	127

v

LIST OF FIGURES

FIGURE		PAGE
1	Control Constructs	7
II-1-1	System Specification Checklist for Computer Resources	2
II-1-2	Model Paragraph 3.3.8, System Specification	3
II-1-3	Model System Specification Section Four	8
II-2-1	SOW Checklist for Computer Resources	12
II-2-2	Model Computer Program Management Task for FSD SOW	14
II-2-3	Sample SOW Paragraph for ATLAS Requirement	14
II-3-1	IFPP Checklist for Computer Resources	21
II-3-2	Model Data Rights Requirement for IFPP	22
II-3-3	Model Computer Resource Requirements for Management Volume of IFPP	24
II-4-1	Table of Software-Related DIDs Commonly Used at ESD	30
II-4-2	Computer Resources CDRL Checklist	45
II-6-1	Sample Computer Resources Evaluation Criteria	48
II-8-1	Computer Program Development Plan Guide/Checklist	58
II-8-2	Computer Program Development Plan Backup Sheets	65
II-9-1	Memorandum of Agreement/Letter of Delegation	71
II-9-2	Self-Inspection Checklist-Software Quality Assurance	76
II-9-3	Software Quality Assurance Plan Checklist	79
II-9-4	Guidance for Applying MIL-S-52779A	82
II-10-1	Computer Program Development Capability Capacity. Review List of Factors	91
II-11-1	Waiver Guidance	115
II-11-2	High Order Language Waiver	116
II-11-3	Instructions on Filling Out a HOL Waiver	124

LIST OF TABLES

TABLE		PAGE
1	Requirements Verification Matrix	10
2	General Purpose Software Development Worksheet	28

Section 1. Systems Specification (A Spec)

1-1. Review MIL-STD-483 and MIL-STD-490, particularly Appendix III of MIL-STD-483 and MIL-STD-490 of Appendix I.

1-2. Review Section 2 (Pages 11-15) of ESD-TR-77-326, Software Acquisition Management Guidebook: Validation and Certification.

1-3. Review and modify as required Figure II-1-2, Model Paragraph 3.3.8, System Specification.

1-4. Review Figure II-1-1, System Specification Checklist for Computer Resources.

1-5. Review and modify as required Figure II-1-3, Model System Specification Section Four.

Figure II-1-1. System Specification Checklist for Computer Resources

NOTE: Items succeeded by an (M) are mandatory.

1(M). Does the system specification contain the mandatory inputs listed in ESD/ALRQ's Model Para 3.3.8?

2. Does the system specification address any sizing and timing requirements? (Usually found in Paragraph 3.2.1 or Paragraph 3.7, in subparagraphs pertaining to computer equipment and peripherals.)

3. Have software performance requirements been functionally and/or quantitatively defined (i.e., to allow for testing compliance)?

4(M). Does the system specification require use of an Air Force approved High Order Language? (AFR 300-10 including AFSC Sup 1; also listed in model paragraph 3.3.8 for System Spec.)

5. Are test methods in Section 4 well-defined (see Figure II-1-3.)?

Figure II-1-2. Model Paragraph 3.3.8, System Specification

This general sample contains minimum essential requirements and is intended to serve as guidance for composing a System "A" Specification Section 3.3.8. Requirements stemming from DOD or AF regulations are indicated by an M in the left margin. These are mandatory inputs to the System Specification. (This is only for information purposes - the M does not go in the final specification.)

3.3.8 Computer Programming. Computer programs and computer data bases shall be considered as software. Software shall be categorized as support or applications software.

3.3.8.1 General Requirements. Software shall meet the following design, language, and coding requirements:

3.3.8.1.1 Design Requirements

3.3.8.1.1.1 Computer Program Structure. The computer program structure shall consist of Computer Program Configuration Item(s), Computer Program Component(s), and Module(s).

a. Computer Program Configuration Item (CPCI). A CPCI is the actual computer program end item in the form of computer instructions stored machine-readable media. A CPCI shall consist of one or more computer program components.

b. Computer Program Component (CPC). A CPC is a functionally, logically distinct part of a CPCI. A CPC is identified for purposes of convenience in specifying and developing a CPCI as an assembly of subordinate elements. A CPC consists of a logical composition of one or more subordinate or interfacing modules.

c. Module. A module performs a complete logical process by execution of a set of instructions which have clearly defined inputs, processing logic and outputs. A module is the smallest set of executable statements able to be assembled or compiled. Each module shall conform to the following conventions:

(1) A module shall consist of a set of instructions in a form consistent with the appropriate language, operating system, and computer.

(2) A module shall not exceed 100 lines of executable source code. This limitation excludes comments and data definitions.

(3) A module shall have only one entry statement and one exit statement.

3.3.8.1.1.2 Top Down Design (TDD). Software shall be designed in a top down manner. The processing activities of the system shall be identified and organized beginning with higher levels of organization, i.e., top levels. These higher levels shall then be expanded and broken out to include a more detailed definition of the processing activities by identification of subordinate levels. The lowest level of processing shall correspond to the module.

3.3.8.1.1.3 Top Down Implementation (TDI). The project software shall be implemented in a top down manner as defined herein. Conceptually, top down implementation proceeds from a single starting point while conventional implementation proceeds from as many starting points as programs in the design. The single starting point does not imply that the implementation must proceed down the hierarchy in parallel. Some branches intentionally will be developed earlier than other branches. For example, user or other external interfaces might be implemented before some of the other partitions to permit early demonstration of software subsystem capabilities, partial software system evaluation, training, or even incremental software system acceptance. The project software shall be implemented in a series of RELEASES which shall provide for successive system capabilities.

(M) 3.3.8.1.2 Programming Languages. Software for this system shall be restricted to JOVIAL J73 as per MIL-STD-1589B, except for automatic test equipment, where ATLAS as per IEEE STD 716-1982 is required. If compelling justification exists, the following languages are allowed:

a. FORTRAN as per ANSI STD X3.9-1978 (FORTRAN 77) (with or without the addition of MIL-STD-1753).

b. COBOL as per FIPS PUB 21-1.

3.3.8.1.3. Structured Coding Requirements. Computer programs coded for the system shall employ only the control constructs listed below. These constructs shall be built using logically equivalent language simulations. Instructions in the language used shall follow the graphic representations in Figure 1.

a. SEQUENCE. Sequence of two or more operations.

b. IF-THEN-ELSE. Conditional branch to one of two mutually exclusive operations and continue.

c. DO-WHILE. Operation repeated while a condition is true. Test is before operation.

d. DO-UNTIL. Operation repeated until a condition becomes true. Test is after operation.

e. CASE. Select one of many possible cases.

3.3.8.2 Operating System (OS) Requirements. The OS shall conform to the following requirements:

a. The OS shall be a vendor-supplied, off-the-shelf package.

b. OS augmentations shall be allowed but shall be limited to new software. No augmentations shall be permitted to be embedded within the vendor supplied OS software; a separate interface shall be provided.

c. No OS interface or augmentation software shall compromise the capability of the OS vendor to provide maintenance over the life cycle of the systems.

d. No instructions shall be executed that will cause the computer to halt processing pending an external event, except by the OS. An exception to this restriction shall be permitted for augmentations to the OS where the augmentation is designed as an extension of the processing control of the OS. The exception is subject to review and approval by the Government.

(M)3.3.8.3 Firmware Requirements. Computer programs and data loaded in a class of memory that cannot be dynamically modified by the computer during processing shall be considered firmware. Requirements on firmware shall be the same as those on software. Use of firmware shall be subject to approval by the Government.

3.3.8.4 Software Utility Services. This support software shall provide the following minimum capabilities:

a. Compilation.

b. Assembly which produces relocatable object code.

c. Linking type loader.

d. Generation, maintenance, and initialization of storage media for programs and data.

e. Diagnostics to support fault isolation.

f. Editing and debugging tools.

3.3.8.5 Message Generation. The generation of error/diagnostic messages shall make a distinction between (1) the requirements for on-line messages to facilitate real-time fault isolation required to maintain the system in operational status and (2) the logging of fault messages onto system files for the category of faults which require isolation and correction but can be addressed off-line and do not degrade the system performance. The required processing time to identify and generate an error/diagnostic message either for on-line or off-line isolation and correction shall not degrade the operational requirements of the system.

a. Processor message and advisory formats shall not require additional interpretation by the operator, such as table lookups and references to documentation, with the exception of lengthy diagnostic procedures to be followed by the operator following an abnormal condition.

b. No computer program shall generate a message or advisory identical to one generated by the OS or by another program.

c. Off-line error messages shall contain as a minimum the following information:

(1) Time error was detected.

(2) Textual description of error condition.

(3) Required operator action where applicable.

(4) Contents of instruction register and program counter at time of error.

(5) Identification of triggering module.

(6) Computer program or system execution status following the error.

On-line error messages shall contain as a minimum the information in Items (1), (2), and (3) above.

3.3.8.6 Program Coding Conventions. Software shall conform to required coding conventions stated below.

a. Each line of source code shall contain no more than one statement.

b. Source code shall be clearly and conspicuously annotated to explain all inputs, outputs, branches, and other items not implicit in the code itself.

c. Names of operator commands, data entries, program components, variables, procedures, and other software components shall be consistent with those used in system design.

d. Code shall be written such that no code is modified during execution.

(M)3.3.8.7 Character Set Standards. Character sets shall conform to standards in NBS-FIPS-PUB-1 Standard Code for Information Interchange, ANS X3.4-1978.

FIGURE 1 - CONTROL CONSTRUCTS

Figure II-1-3. Model System Specification Section Four

4. QUALITY ASSURANCE PROVISIONS:

4.1 General. This section specifies the requirements for formal verification of the design, construction and performance of the XXX system in order to demonstrate compliance with all requirements of Section 3 of this specification. Each of the requirements of Section 3, which is to be verified by engineering test and evaluation is specified in Table _____ by its requirements paragraph number. Development Test and Evaluation (DT&E) shall be accomplished at (Government or contractor) facilities. Operations Test and Evaluation (OT&E) shall be accomplished at _____ facilities.

4.1.1 Responsibility for Verification. General responsibility relating to test and evaluation are given herein; specific details are given in the appropriate Statement of Work. The ESD Program Office (PO) will be the Responsible Test Organization (RTO) and will be responsible for the overall management of test and evaluation of the XXX system. Government representative(s) designed by the RTO will witness all formal test activities, unless the contractor is notified otherwise by the PCO, and will certify test data.

4.1.2 Special Test (Optional). (Examples of special tests could be environmental, S/V, tempest, etc.)

4.2 Quality Conformance Inspection. Requirements for formal tests of system, functional area, and CI/CPCI performance design characteristics and operability as defined in Section 3 shall be accomplished as specified in the XXX verification cross reference matrix. The explanation of the XXX test verification cross reference methods, and the verification tests are specified below.

4.2.1 Verification Cross Reference Matrix. XXX's verification cross reference matrix is contained in Table _____. The verification cross reference matrix identifies all Section 3 requirements by paragraph number and title, method(s) of verification, and test(s) where verification shall be performed. The verification methods are indicated by the notations: I (inspection), A (analysis), D (demonstration) and T (test). The verification tests are indicated by the notation P (preliminary qualification test/informal test), F (formal qualification test), S (system integration test) and O (operational test and evaluation). All tests associated with a requirement shall be listed by notation(s), (P, F, S, and/or O) under the appropriate method(s) of verification.

4.2.2 Methods of Verification. The definition of inspection, analysis, demonstration, and test are defined below.

4.2.2.1 Inspection. Verification by visual examination of the item, reviewing descriptive documentation, and comparing the appropriate characteristics with a reference standard to determine conformance to requirements. This includes mechanical inspection of equipment, verification of accuracy and completeness of documentation, data storage table structure and capacity, and computer program source code audits.

4.2.2.2 Analysis. Verification by evaluation or simulation using mathematical representations, charts, graphs, circuit diagrams, or data reduction. This includes analysis of algorithms independent of computer implementation, analytical conclusions drawn from test data, and extension of test-produced data to untested conditions.

4.2.2.3 Demonstration. Verification by operation, movement or adjustment of the item under a specific condition to perform the desired function. This includes content and accuracy of displays, comparison of system products with independently derived test cases, prompt system recovery from induced failure conditions, and verification of reliability, maintainability, and availability.

4.2.2.4 Test. Verification through systematic exercising of the applicable item under all appropriate conditions with instrumentation and collection, analysis, and evaluation of quantitative data. This includes electrical continuity, proper operating voltages, correct grounding tolerance of interference, correct computer program control flow, correct computer program data flow and acceptance of proper ranges of values.

4.2.3 Verification Tests. Formal verification tests shall be established to assure the XXX software meets all requirements allocated to software elements. These tests shall consist of Development Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E).

4.2.3.1 Development Test and Evaluation (DT&E). DT&E is accomplished to verify that the CPCI(s) meets performance and design requirements. DT&E consists of PQTs, FQTs, and an SIT.

4.2.3.1.1 CPCI Preliminary Qualification Tests (PQTs). Tests conducted for those functions or CPC(s) which are critical to the CPCI. The selector of critical functions to be tested during PQT may be based on time or performance critical requirements.

4.2.3.1.2 CPCI Formal Qualification Tests (FQTs). Tests accomplished to verify that each CPC meets the requirements of its CPCI specification and that the requirements of 3.3.8 herein, have been met. Program and group programs shall be tested to verify that they perform their intended function properly and to verify the interoperability of each CPC with all other CPCs. This process shall be applied to the individual software CPC of each CPCI and shall be continued until all programs have been verified.

4.2.3.1.3 System Integration Test (SIT). Test conducted to provide that all CPCs and CPCI(s) working together meet all system performance requirements. SIT verifies that the full configured XXX performance is in accordance with requirements of the specifications. SIT shall be performed on the first article.

4.2.3.2 Operation Test and Evaluation (OT&E). OT&E determines whether the system will satisfactorily perform the function for which it is designed in the mission environment.

TABLE 1 REQUIREMENTS VERIFICATION MATRIX

SPECIFICATION PARAGRAPH NO	PARAGRAPH TITLE	VERIFICATION METHOD				REMARKS
		INSPECTION	ANALYSIS	DEMONSTRATION	TEST	

Section 2. Statement of Work

2-1. Review ESD-TR-77-16, SOW Preparation Guidebook.

2-2. Review Figure II-2-1, Sow Checklist for Computer Resources.

2-3. Review and adapt Figure II-2-2, Model Computer Program Management Task for a Full Scale Development (FSD) Statement of Work (SOW).

2-4. Contact ESD/OCH for use of the automated SOW available as part of the Computer Generated Acquisition Document System (CGADS).

2-5. Review and adapt Figure II-2-3, Sample SOW Paragraph for ATLAS Requirement if software for support equipment is to be developed under the contract.

Figure II-2-1. SOW Checklist for Computer Resources

NOTE: Those items succeeded by an (M) are mandatory.

1(M). Has the contractor been tasked with preparing, updating and delivering the Computer Program Development Plan (CPDP) IAW the DID? (AFR 800-14, Vol II, Para 3-9) (Note: If a CPDP was required as part of IFPP, SOW usually requires delivery of final CPDP and as required updates). Has the contractor been tasked to adhere to the CPDP?

2(M). Has the contractor been tasked with adhering to the computer program requirements listed in Para 3.3.8 of the system specification?

3(M). Has the contractor been tasked with treating firmware as software? (AFR 800-14, Vol I, AFSC Sup 1)

4. Does the SOW contain requirements similar to those listed in ASD/ALSC's Model SOW Task for software development?

5(M). Has the contractor been tasked with the preparation of development (B5) and product (B5) specifications? (AFR 800-14, Vol II, Chapter 7 and MIL-STD-483 Appendix III)

6(M). Has the contractor been tasked with Preliminary and Formal Qualification Testing and System Integration Testing of each Computer Program Configuration Item in accordance with contractor prepared, AF approved test plans and procedures? (NOTE: PQT responsibility may be delegated to the contractor and not specifically identified as a separate test) (AFR 800-14, Vol II, Para 5-3 and AFR 80-14)

7(M). Have the specific Operational Test and Evaluation requirements and contractor responsibilities been clearly defined? (AFR 800-14, Vol II, Para 5-4)

8(M). Has the contractor been tasked with the development of a Software Quality Assurance (SQA) Program in accordance with MIL-S-52779A? (AFSCR 74-1)

9(M). Has the contractor been tasked with preparing, delivering, and updating the SQA Plan or been tasked with incorporating the SQA Plan in the CPDP IAW the DID? (Note: Delivery is not mandatory, in which case IAW DID would not appear.)

10(M). Has the contractor been tasked with requesting a Computer Program Identification Number (CPIN) for each CPCI and using this CPIN along with the specification number on all documentation pertaining to the CPCI in accordance with the DID. (AFR 800-14, Vol II, Para 6-5) (DI-E-3192A should appear in the SOW.) Also, this tasking may be in a configuration management task.)

11. Have SW considerations been made an item for PMRs?

12. Are preliminary design reviews and critical design reviews IAW MIL-STD-1521A required for all CPCIs with agendas and minutes prepared by the contractor and delivered IAW the DID? (May be contained in the Reviews and Audits Task.)

13. Has software/computer resources been included as a possible topic for technical interchange meetings?

14. Are functional and physical configuration Audits IAW MIL-STD-1521A required for each CPCI? (These may be combined. Also, the tasking may be in a reviews and audits task.)

15. Is the contractor tasked with preparing IAW MIL-STD-483 and delivering IAW the DID configuration management related data for CPCIs? (Eng. engineering change proposals version description documents, configuration index, change status report (computer program), specification notice (computer program). Also, this tasking may be in a configuration management task.)

16. Is the contractor tasked with using ATLAS (Common ATLAS as defined in the IEEE Std 716-1982 or its approved successor) as the HOL for all support equipment software? (See Model SOW paragraph, figure II-2-3.)

Figure II-2-2. Model Computer Program Management Task for a Full Scale Development (FSD) Statement of Work (SOW)

The following is a model Computer Program Management Task for a Full-Scale Development Statement of Work. This model task doesn't include all the work the contractor has to do in relation to software. So, when writing the Computer Program Management Task, a cross check of the other tasks will be required to insure all the work is specified. The following is a list of some of the software tasks not included in the Computer Program Management Task (also listed after the subject is where the task is usually specified and the appropriate wording that is included).

A. Computer Program Identification Numbers (CPINs)
(Usually asked for in the Configuration Management Task)

The contractor shall request a CPIN for each CPCI in accordance with the CDRL. The contractor shall use the CPIN along with the specification number on all documentation pertaining to the CPCI.

B. Reviews and Audits
(Usually asked for in the System Engineering Task)

As part of the system engineering process, the contractor shall conduct the following contractual reviews IAW MIL-STD-1521A.

C. Testing
(Usually asked for in the Test and Evaluation Task)

Figure II-2-3. Sample SOW Paragraph for ATLAS Requirement

NOTE: This paragraph should be included in the SOW when software for support equipment is to be developed under the contract.

"All test programs must be coded in ATLAS (Common ATLAS as defined in the Institute of Electrical and Electronics Engineers Std IEEE 716-1982 or its approved successor). Any deviations from the standard must have prior approval of the appropriate authorities. In such cases, the contractor must fully justify and document all such deviations/extensions."

TASK XX

Computer Program Management

XX.1 GENERAL REQUIREMENTS

The contractor shall design and develop the computer programs to satisfy the design and performance requirements in Specification No. XXX. The contractor's approach to software development under this contract shall conform to that approach presented in the contractor-prepared, government approved, Computer Program Development Plan (CPDP) which shall be delivered and updated by the contractor in accordance with the DID. The PCO's approval of the CPDP shall not relieve the contractor from complying with any of the requirements of this contract. All computer programs shall be controlled in accordance with the requirements established in the Configuration Management Task of this SOW.

The overall intent of this task and the computer programming requirements of paragraph 3.3.8 of Specification No. XXX is to mandate minimum computer programming requirements; this shall not preclude exceeding these minimum requirements.

XX.2 Software Development Technologies/Management Practices

All computer programming accomplished under this contract shall be accomplished in accordance with the management practices, tools/techniques, and programming and organizational structure as defined in the CPDP and the following software development technologies as defined in Specification No. XXX, paragraph 3.3.8:

a. Top Down Design

b. Top Down Implementation

c. Use of High Order Language

d. Structured Coding

The contractor's approach to implementing each of these development technologies/management practices shall be defined in the CPDP. The approaches described in the CPDP shall become effective upon contract award and shall remain in effect through final acceptance of all project software by the PCO. The Government reserves the right to review or inspect documentation or facilities which verify compliance with development technologies/management practices defined in the CPDP.

XX.3 LIFE CYCLE ACTIVITIES

XX.3.1 Analyses

The contractor shall analyze the requirements of Specification No. XXX and accomplish the following studies. These shall be prepared and delivered IAW the DID.

XX.3.1.1 Sizing and Timing Analysis

The contractor shall perform a detailed sizing and timing analysis of each CPCI. The contractor shall combine the results of these analyses to determine the composite sizing and timing requirements. The contractor shall also examine in detail the dependence of the sizing and timing requirements on the overall system design. [NOTE: For large systems, requiring sizing and timing analysis to the CPL level may be more appropriate. If the referenced paragraphs of the system specification for the system being addressed do not contain information on software utility services, then the last sentence of Paragraph XX.3.2.1 should not be used.]

XX.3.1.2 Data Base Architecture Analysis

The contractor shall examine the data base architecture as a critical topic in software design. Alternate approaches to data base management, addressing, and directory structure shall be investigated by the contractor (in terms of memory requirements, access and update timing, and ease of data base expansion) in order to determine an approach which achieves the access, buffering and queueing capabilities required to meet the functional requirements.

XX.3.1.3 Risk Analysis

The contractor shall define and analyze areas of software risk.

XX.3.2 Design

The contractor shall document the rationale supporting his system design IAW the DID as follows:

XX.3.2.1 Software Design Criteria and Decisions

The contractor shall define the design criteria and decisions for all software by graphic representation and supportive text (i.e., software diagrams, interface definition, trade studies, or rationale). The contractor may propose to develop the software using a different set of software utility services than will be delivered with the system. In this case, the contractor shall demonstrate that the delivered software utility services meet the operation, maintenance, and training capabilities specified in Paragraphs 3.1.7, 3.5.1, and 3.6.2, respectively, of Specification No. XXX prior to system test. [NOTE: For large systems, requiring sizing and timing analysis to the CPL level may be more appropriate. If the referenced paragraphs of the system specification for the system being addressed do not contain information on software utility services, then the last sentence of Paragraph XX.3.2.1 should not be used.]

XX.3.2.2 Hardware Selection Criteria and Decisions

The criteria and decisions for the selection of all computer hardware shall be defined and delivered to the Government in the form of supportive text IAW the DID.

[NOTE: The information can be included in the Data Item Description (DID) for a Technical Report (DI-S-3591A) or in the CPDP DID (DI-S-30567A). In either case, modification of the DID is required.]

XX.3.2.3 CPCI Organization and Decomposition

A complete list and the rationale behind the organization of CPCIs shall be defined and delivered to the Government. Appendix XVII of MIL-STD-483 shall be used as a guide. The following shall apply to the organization of CPCIs:

a. The number of CPCIs shall be minimized.

b. CPCIs shall not be organized across vendor product lines. That is, a CPCI shall operate and be tested on a single vendor computer system.

c. A separate CPCI shall be provided for each unique OS. A unique OS is defined to be a single vendor product which controls the allocation of computer resources for a single vendor computer system.

d. A separate CPCI shall be provided for each unique set of software utility services. Unique software utility services are defined as the set of software utility services (compilers, assemblers, diagnostics, and editors) which a vendor provides to support a single computer system.

XX.3.3 Testing

The contractor shall test the project software in accordance with Section 4 of Specification No. XXX, the CPDP, and the Test and Evaluation Task of this SOW using contractor prepared, government approved test plans and procedures. The contractor shall prepare a separate Test Plan, Test Procedures and Test Report for each CPCI IAW the DID.

XX.3.3.1 System Integration Testing

The contractor shall conduct system integration testing in order to demonstrate that the total system meets the requirements of the system specification. The contractor shall provide all necessary software and hardware test tools to demonstrate these requirements. These tools shall be reviewed by the Government prior to beginning system integration testing.

XX.3.4 Documentation

In accordance with paragraph 3.3.8 of Specification No. XXX, the Configuration Management Task of this SOW, and the CDRL, the contractor shall deliver to the Government the documentation for design, quality assurance, delivery, installation, operation, maintenance support and all other requirements for all generated Configuration Items (CIs), and Computer Program Configuration Items (CPCIs). Computer program specifications, vendor supplied operating systems and software utility services documentation, user's manuals, reference manuals and maintenance manuals shall be prepared and delivered in accordance with the DID.

The application of top down modular design, implementation and structured programming concepts in the subject contract may encourage the use of new software documentation methods. Therefore, the contractor may describe documentation techniques in the CPDP which meet or exceed the requirements of present B5 and/or C5 standards. Government review and approval of all alternate B5 and/or C5 documentation shall be accomplished prior to implementation.

For all firmware generated by the contractor, documentation of the computer programs and data shall be in accordance with MIL-STD-483, Appendix VI or XVI. The memory portion and the hardware portion shall be documented in accordance with MIL-STD-490, Appendixes II and VIII.

XX.4 SUPPORT SOFTWARE

The term "support software" refers to the collective support of the Operating System (OS) and software utility services as described in paragraph 3.3.8 of Specification No. XXX.

The term "off-the-shelf" refers to an item which has been produced and placed in stock by a contractor prior to the contractor receiving orders or contracts for the sale of the item. In addition, the item must (1) have been delivered to at least one customer (military/federal or commercial), (2) have passed said customer acceptance testing, and (3) be operating under said customer control within the user environment. The contractor may produce the item to either commercial or military/federal item specifications or descriptions. Off-the-shelf items include items stocked by distributors for which Government contracts may be received.

The contractor shall identify all off-the-shelf support software necessary to develop, produce, operate, modify and maintain the project sofware. This description shall be available for Government Review and Approval and delivered IAW the DID.

The support software shall be identified in the CPDP and shall operate on a contractor defined computer system, which is subject to Government approval. All support software shall be capable of being executed using a standard off-the-shelf operating system which meets the requirements of paragraph 3.3.8 of Specification No. XXX.

XX.5 SOFTWARE DEVELOPMENT REVIEWS

XX.5.1 Software Reviews

The contractor shall report to the Government on the status of the design, coding, testing, documentation, and maintenance of all project software as part of the Program Monthly Reviews. The software reviews shall address the contract progress of the software development activities up to the date of the review and shall include visual representation addressing project software down to the module level including sizing and timing data. In addition, the software reviews shall include a review of the status of the management practices and tools/techniques and program organizational structure.

XX.5.2 Informal Software Development Reviews

The Government reserves the right to inspect any information or documentation generated by the contractor and subcontractor personnel assigned to this task or to witness any test associated with this task at any time within the normal work schedule of such personnel. It is the intent of the Government to have access to contractor information/documentation relating to this task at the contractors facility without interfering with the contractor and the performance of this task.

XX.5.3 Formal Reviews

The formal review procedures as described in the System Engineering Task of this SOW shall be applied to all computer programming efforts.

XX.6 APPLICABLE DOCUMENTS

The contractor shall comply with the following documents to the extent specified:

Number and Date	Title	Tailored Application
spec number Spec date	spec title	All
MIL-STD-483 31 December 1970 Notice 2 21 March 1979	Configuration Management Practices for Systems Equipment, Munitions and Computer Programs	Sections 1-6 App. XVII, XVI, VI
MIL-STD-490 30 October 1968 Notice 1 1 February 1969	Specification Practices	Sections 1-6 App. II, VIII

Section 3. Instructions for Preparation of Proposal (IFPP)

3-1. Insure that the IFPP is consistent with the Advanced Procurement Plan, the Source Selection Plan, and particularly the evaluation criteria.

3-2. Review Figure II-3-1, IFPP Checklist for Computer Resources.

3-3. Review Figure II-3-2, Model Data Rights Requirement for IFPP.

3-4. Review Figure II-3-3, Model Computer Resource Requirements for Management Volume of IFPP.

Figure II-3-1, IFPP Checklist for Computer Resources

NOTE: Items succeeded by an (M) are mandatory.

1. Does the IFPP contain inputs similar to those listed in ESD/ALEQ's model IFPP paragraph?

2. Is the proposer required to submit a preliminary Computer Program Development Plan (CPDP) and Software Quality Assurance Plan (SQAP) with his proposal? (SQAP may be included as part of the CPDP per AFR 74-1.) If not, is software specifically required to be covered in the technical and management volumes of the proposal?

3. Is the proposer required to address the alternatives listed below?

(a) Lease vs purchase of equipment and programs.

(b) Computer modularity from a growth vs cost and schedule standpoint.

(c) Computer program modularity from a maintainability vs cost and schedule standpoint.

(d) Proposed use of existing software.

4(M). Is the proposer required to include waiver information with his proposal if he plans to use a non-standard HOL? (AFR 300-10 including AFSC Sup 1 and AFSC Sup 1 to AFR 800-14, Vol I)

5. Is the proposer required to address areas of risk in the development of computer hardware and software with regard to schedule and cost impact?

6. Do the selection criteria include management of computer resources and software development methodology?

Figure II-3-2. Model Data Rights Agreement

NOTE: These paragraphs should be tailored as appropriate and can be required in almost any volume of the proposal depending on the topic to be stressed (e.g., cost, technical, logistics).

X.X.X INSTRUCTIONS PERTAINING TO SPECIAL DATA PROVISIONS:

Offerors shall submit a Summary Letter on Data and Software/Firmware Rights setting forth in full their proposal (including all subcontractors' positions) regarding such technical data and computer software/firmware rights. This Summary Letter shall take precedence over any other statement in the offeror's proposal with regard to technical data and computer software/firmware rights. Written guarantees from subcontractors (at all tiers) setting forth their position on data and software/firmware rights shall also be included as attachments to the Summary Letter including their express agreement to accept the requirement of DAR 7-104.9(a) that it be flowed down to all subcontracts. The Summary Letter and the subcontractor guarantees shall separately address each subcontractor's position regarding technical data and computer software/firmware rights in regard to (a) follow-on competitive operation and maintenance service contracts and (b) follow-on competitive production contracts, as described below.

(a) It is the requirement of the Government to have the opportunity to compete follow-on O&M Service contracts. It is therefore required that all technical data and computer software/firmware to be furnished under this solicitation be furnished with the rights as set forth in the Rights in Technical Data and Computer Software clause DAR 7-104.9(a). Specifically, note that subparagraph (b)(1)(vii) of the clause requires that all manuals or instructional materials prepared or required to be delivered under this contract or any subcontract hereunder for installation, operation, maintenance or training purposes shall be provided to the Government with unlimited rights.

(b) The Government additionally requires the ability to competitively procure any follow-on production or Operation and Maintenance (O&M) requirements for the XXX which may be ultimately produced after Phase XXX of the contract contemplated by this solicitation. Therefore, it is necessary to obtain a technical data and computer software/firmware package suitable for use in competitive reprocurement of the system and its components and competitive procurement of O&M. For this reason, it is required that the offerors and their subcontractors submit to the PCO for approval a plan for avoiding the use of any restricted rights computer software/firmware or items, components, software/firmware and processes for which technical data would qualify for limited rights under the criteria of DAR 7-104.9(a) such that the rights provided the Government would be inadequate for such competitive follow-on procurement. In addition to the minimum restricted rights in computer software/firmware and limited rights in technical data pursuant to DAR 7-104.9(a), the Government requires as a minimum the additional right to disclose and have used by third parties any such technical data or computer software/firmware required under the contract including Phase XXX CLIN YYYY "Option for Additional Technical Data and Computer Software", for the purposes of competitive procurement of the XXX system. Where necessary, these

additional rights shall be acquired by the Government under Special Provision ZZ, "Option for Government to Acquire Additional Rights in Technical Data and Computer Software, Direct Licensing or Technical Additional Subject to Equitable Adjustment in Price" and CLIN YYYY "Option for Additional Technical Data and Computer Software".

Figure II-3-3. Model Computer Resource Requirements for Management Volume of IFPP

NOTE: If the contractor is asked to deliver a preliminary CPDP with his proposal, the following model is not needed.

X.X Computer Software Development/Management

X.X.1 Organizations, Schedules and Resources

a. Organizations

(1) Show the prime and subcontractor's technical organization structure, responsibilities, interfaces, skill requirements, and lines of communication for his program office for the subject contract.

(2) Show the organizational responsibility and structure of the software development office(s), both prime and subcontractor.

b. Deliverables/Documentation

(1) Describe the approach for developing computer program documentation to include preliminary, interim and final versions.

(2) Describe any new software documentation tools/techniques which meet or exceed the requirements of present B5 and/or C5 standards which you intend to use on the subject contract. This description shall identify the specific alternatives by describing the necessary changes to the content and format of the B5 and/or C5 standards as described in MIL-STD-483. Any proposed changes shall at a minimum describe the equivalency features between existing documentation requirements of the standard B5 and/or C5 and the proposed alternative(s). Discuss the relationship of the documentation to top down design and structured programming.

(3) Describe the approach to computer program in-line commenting.

(4) Describe your methodology for choosing CPCIs.

c. Progress/Status Reporting

(1) Describe your approach to software development program reporting.

(2) Describe your approach to identifying and surfacing software development problems.

(3) Describe the methods and procedures for collecting, analyzing, monitoring, and reporting on the size and timing of CPCIs.

(4) Describe the conduct of all internal project reviews.

d. Facilities

(1) Identify software development facilities to be used.

(2) Identify all computer resources including simulators, prototypes, etc., to be used.

(3) Identify all testing resources to be used.

(4) Identify all tools, deliverable and not deliverable, that are planned for use in the development of the testing of the computer programs.

e. Software Design Production Schedule

(1) Detailed software schedule. This schedule will be a graphic representation of the detail development milestones, scheduled activities and deliverables. The graphic network shall include an identification of critical path elements. The contractor's schedule shall identify the time allocated for the Government's review of software and hardware related data submissions.

(2) A list of delivery dates for all operational and support hardware, operational and support software, and each data submission by document number/title will be included.

f. Labor Phasing

(1) Provide a proposed schedule for labor phasing by labor category per month that will be allocated to each CPCI. Table 1 shall be completed for the composite expenditure of manpower allocated for each CPCI. Additionally, a definition of labor categories will be provided.

(2) Describe the positions and the experience level of personnel to be used in each phase of the software development cycle.

(3) Identify any key personnel in the software development area, their anticipated position, their qualifications and their responsibilities.

X.X.2 Software Development and Testing Methodology. This description shall identify the contractor's experience with each of the software development and testing methodologies to be applied to the subject contract. This description shall distinguish between existing contractor capabilities and those capabilities to be implemented solely for the subject contract.

a. Software Requirements

The offeror is required to use an approved standard High Order Language (HOL) for the system in accordance with System Specification X.X.X. If use of an HOL is not feasible, a justification for use of an alternate language must be submitted containing information as indicated in (2) below.

(1) Discuss the effects of the proposed language(s) on top down design, structured programming, data base design, manpower and software maintenance. Provide a description of each language translator including its level of optimization and macro capabilities. The offeror shall consider the above in light of Section b below.

(2) Discuss your approach to implementing the requirement for using a single approved HOL. If the offeror feels that the software must be coded in a non-standard HOL or assembly language, identify the language proposed and demonstrate that this selection will satisfy requirements more effectively. This tradeoff analysis should assess programming language selection effect on manpower, schedule, system performance and software maintenance.

(3) Describe your approach to analyzing system requirements and deriving the detailed functional requirements. Show the mapping of functional requirements to CPCIs.

(4) Describe the software risk areas and the approach to minimizing these risks.

b. Design

(1) Describe top down design methodologies to be used.

(2) Describe your approach to data base design.

(3) Describe your plan for insuring program growth, modularity and ease of modification. Also include description of the plan for controlling computer program growth, to keep it within any imposed limits.

(4) Show the estimated size in each language to be used for each CPCI.

(5) Describe all existing software to be used, its language, and the CPCI it will be included in; also include the instruction count in Table 1 for each CPCI.

(6) Describe all modifications to existing software, if any, and include instruction counts in Table 1 for each CPCI.

(7) Specifically identify all restricted rights software to be delivered and describe the restricted rights.

c. Code, Debug and Unit Test

(1) Describe your software implementation approach.

(2) Describe all software programming languages, practices, standards, methods and conventions intended for use on this contract.

(3) Describe all software development documentation and the procedures which will be used to keep the documents current.

(4) Describe any progress monitoring/reviews.

(5) Describe any computer program problem reporting methods.

(6) Describe your approach to unit level code testing.

d. Development Testing

(1) Describe the extent of in-plant testing including test planning, test methods, documentation and test reporting. The general procedures for reporting, monitoring and resolving program errors and deficiencies discovered during in-plant testing should be also described.

(2) Describe the method for insuring satisfactory program testing and qualification of computer programs. This should include a discussion of the approach to Preliminary and Formal Qualification Tests.

X.X.3 Software Management and Control

a. Design and Development Controls

Describe your software management practices, tools, and techniques and how these will control the risk areas.

b. Configuration Control

(1) Describe facilities and procedures to be used to maintain configuration control during the software development to include error correction control during integration and test, as well as development.

(2) Describe facilities and procedures to be used after first system acceptance, if applicable.

c. Maintenance

(1) Describe methods for in-plant and on-site identification and correction of software and documentation deficiencies.

(2) Describe the maintenance approach for all vendor supplied off-the-shelf software (operating systems and utility services).

(3) Describe the maintenance approach for all contractor-developed software. Include in this description how you conceive the distribution and installation of patches and other changes to the fielded systems.

(4) Describe the capabilities, tools, and equipment to be delivered for software maintenance.

Table 1. General Purpose Software Development Worksheet Date ____

IDENTIFICATION	CPCI 3	example column	1	2	.....	N
	WBS Element Name	radar control				
	Responsible Organization	XYZ Corp				
*1 ESTIMATED NUMBER OF INSTRUCTIONS BY CPCI	Existing Code *2 Size/ Lanugage(s)	12,000A 2,000F				
	Conversion Code *3	8,000F				
	New Code	10,000A 2,000F				
	Total Code	22,000A 12,000F				
ESTIMATED EFFORT REQUIRED BY CPCI IN MANMONTHS	Analysis	16				
	Design	42				
	Code & Checkout	20				
	Test & Integration	32				
	Installation	12				
	Operation & Support	20				
	Documentation	10				
	Other (specify) _____					
	Total Manmonths	152				

*1 For language use F for Fortran, A for Assembly and specify any others.
*2 Existing ___ An instruction requiring no alternation.
*3 Conversion ___ An instruction requiring an alteration.

Section 4. Contract Data Requirements List (CDRL)

1. Review:

AFR 310-1

AFSCR 310-1 including ESD Sup 1

AFR 80-45 and AFSC, ESD Supplements to it.

Acquisition Management Systems & Data Requirements Control List (DOD 5000.19-L Vol II)

2. Review Figure II-4-1, Table of Software-Related DIDs commonly used at ESD, for applicability. Modify any DID necessary to meet specific requirements and provide the necessary back-up sheets.

3. Prepare CDRL inputs using Figure II-4-2, Computer Resources CDRL Checklist and provide to Data Manager.

4. Insure that every deliverable needed is contained in the CDRL.

5. Contact ESD/OCH for use of the automated CDRL available as part of the Computer Generated Acquisition Document System (CGADS).

NOTE: Data is expensive. Buying data without a valid requirement is wasteful, not only of government money but contractor time. All requirements for data should be reviewed carefully and any redundant or unnecessary data eliminated. Secondly, another way to reduce the high cost overhead in purchasing data is to tailor "down" the information required by the data item. This requires reviewing Block 10 (Preparation Instructions) of the DD Form 1664 to determine if all the information the contractor has to provide is needed. If not, those particular paragraphs of data should be deleted. This is done by making the following changes to the form (e.g., DD 1423, AFSC Form 708) used in the CDRL: annotate the data item number with a "/T" and state what paragraphs are deleted in the remarks section. A contract Data Requirement List (CDRL) should reflect data which is useful, important, and above all, necessary.

NOTE 2: There are three different kinds of unique DIDs

a. Unique DIDs from other commands - still valid

b. Unique DIDs for general ESD use - not valid unless stated in Ira Reimer letter, see attached letter

c. Unique DIDs for a specific program or project (The Approval Limitation Block would specify if the DID applied to a particular program or contract, e.g., For use on contract F19C-00-1143) - valid for that particular program or contract and any follow-on.

Figure II-4-1. SOFTWARE-RELATED DIDS COMMONLY USED AT ESD

The following is a table of Data Item Descriptions (DIDs) pertaining to software. This is not intended to be a complete list of all software DIDs, but those recommended for and commonly in use at ESD. DOD 5000.19L, Volume II, Acquisition Management Systems and Data Requirements Control List (AMSDL) should be consulted to determine what DIDs are available and which ones have been superseded, cancelled, or replaced. An important thing to remember is that each time a contractor generates documentation, it costs money. Only ask for data that is necessary. Read the data item descriptions (DD Form 1664) carefully to determine whether you need it or not and modify it if it doesn't fit your needs.

If MIL-STD-1679(NAVY) is part of the contract, it has its own set of DIDs associated with it. Normally, AF programs do not use these DIDs, instead using ones associated with MIL-STD-483 and MIL-STD-490 such as those given in the table on the following pages. For reference purposes, the DID numbers and names listed at the end of MIL-STD-1679 are as follows:

Interface Design Specification (IDS)	DI-E-2135
Program Performance Specification (PPS)	DI-E-2136
Program Design Specification (PDS)	DI-E-2138
Program Description Document (PDD)	DI-S-2139
Data Base Design Document (DBD)	DI-S-2140
Program Package Document	DI-S-2141
Computer Program Test Plan	DI-T-2142
Computer Program Test Specification	DI-E-2143
Computer Program Test Procedures	DI-T-2144
Computer Program Test Report	DI-T-2156
Operator's Manual (OM)	DI-M-2145
System Operator's Manual (SOM)	DI-M-2148
Software Quality Assurance Plan	DI-R-2174
Software Configuration Mgt Plan (SCMP)	DI-E-2175
Software Development Plan	DI-A-2176
Software Change Proposal (SCP)/Software Enhancement Proposal (SEP)	DI-E-2177
Computer Software Trouble Report (STR)	DI-E-2178

Explanation of column labels in table:

DID NUMBER/TITLE/SOURCE DOCUMENT - Number, title, and source document of DID as stated in the AMSDL
DESCRIPTION - summary of block 3, description/purpose, on the DD Form 1664 for the actual DID
GUIDANCE - summary of block 7, application/interrelationships, on the DD Form 1664 for the actual DID
(NOTES in this column indicate additional ESD guidance/use)

DID NUMBER/TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section 1. DIDs for Schedule and Status Information		
A-3002 R&D Status Report DAR/ASPR 7-404.6	Brief narrative description of status used by procuring activity for visibility and management purposes.	Used to inform project management of contractor activity and progress toward accomplishment of contractual objectives and advancement in state-of-the-art on research and development contracts; not a substitute for technical reporting. NOTE: can be used on other types of contracts.
A-3007 Program Schedule AFSCM 375-4	Portrays (a) the phases, major milestones and major segments of the development, test, production and support activities; and (b) the significant program progress made by the contractor between reporting dates	Used for less complex acquisitions. Will not be applied to contracts requiring more sophisticated reporting (See DI-A-3009).
A-3009 Program Milestones (Acquisition Phase) AFSCM 174-1	Outlines basic concepts of the system and its acquisition process. Provides framework for detailed plan development based on work breakdown structure.	Based on the work breakdown struture. Developed during contract definition phase and updated during the acquisi- phase.
A-5032B Project Status Reports, Computer Software TBD	Defines minimum requirements for status reports which describe the contractor's performance under computer software contracts.	Provides the project manager with a regular, periodic summary of the contractor's overall performance in meeting technical requirements of the contract. Normally imposed in conjunction with DIDs which require fiscal and manpower data and a project planning chart.

DID NUMBER/TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section 2. DIDs for use with Formal Reviews and Audits		
A-3029 Agenda - Design Reviews, Configuration Audits, and Demonstrations MIL-STD-1521A + Notice 1, SAMSO-STD-76-1	Notifies procuring activity of design reviews, configuration audits, and other types of demos required by the procuring activity. The agenda sets forth the purpose and objectives to be accomplished. A separate agenda is required for each review, audit, or demonstration.	The agenda is required to be submitted prior to each design review, configuration audit or demonstration to allow planning by the procuring activity and for the review of any data which will be subject to the review.
E-3118 Minutes of Formal Reviews, Inspections and Audits MIL-STD-1521A + Notice 1, SAMSO-STD-76-1	Contractor-prepared document which is used to provide a record of the results of reviews, inspections and audits of a system or CPCI.	Used on contracts requiring formal technical reviews and audits (e.g. SRR, SDR, PDR, CDR, FCA, PCA, and FQR).

DID NUMBER, TITLE & REQ DOCUMENT	DESCRIPTION	GUIDANCE
Section 2. DIDs for Software Management and Reporting		
S-30568 Computer Program and Sizing Data AFR 800-14	Used to obtain both estimated and actual computer program memory size requirements, computer program timing requirements and CPCI interface data.	Designed for use with E-30139, E-30140 and E-30144. NOTE: E-30139 and E-30140 have been rescinded. Can be used with E-3119B & E-3120B or with E-30130A or with E-30113 & E-30110 instead.
S-30567A Computer Program Development Plan (CPDP) AFR 800-14	Tasks the contractor to provide a detailed plan for the management and development of all the computer programs and associated documentation needed for the completion of the contract.	Used for all software acquisitions. May be obtained contractually in the bidders' proposals. NOTE: backup sheets are commonly used; model available from ESD/TOEQ.
(U)-A-758/ESD-DELETED* Firmware Development Plan AFR 800-14 (Use S-30657A)	Identifies the contractor activities required to develop and deliver firmware/software and the associated hardware, documentation, and necessary support resources	This plan may be included as part of the CPDP in acquisitions that are of a primarily software nature. May replace the CPDP in a primarily firmware acquisition
B-3521 Software Quality Assurance Plan MIL-S-52779A	Describes the SQA Program organization and procedures of the contractor to assure that software delivered under this contract complies with the requirements of the contract.	Provides visibility of software quality assurance procedures to be used by the contractor. Gives detailed knowledge of the approach to quality assurance taken by the contractor. The SQA Plan may be included as a part of the Computer Program Development Plan.

*This DID was deleted. See NOTE 2 on page II-35.

DID Number Title Source DOCUMENT	DESCRIPTION	GUIDANCE
Section 4. Computer Program Configuration Item (CPCI) Specification and related DIDs		
E-3101 System Specification MIL-STD-483 + Notice 1 MIL-STD-490 + Notice 2	Establishes the performance, design, development, and test requirements for the system.	Establishes the functional baseline for the system and provides the criteria from which performance and functional parameters of configuration items of the system are allocated and incorporated in a configuration identification for each item.
E-3104 Addendum Specification MIL-STD-483 + Notice 1	This creates a new configuration item specification. Used when there is a requirement to retain the existing CPCI for some applications and the modified CPCI can be created by minimum redesign of the existing CPCI.	Used when there is sufficient reason to establish direct relationship between the new CPCI and an existing CPCI as the basis for design and development and the basic specification complies with MIL-STD-483 format.
E-30131 Interface Control Documents MIL-STD-490 + Notice 2	Controls interfaces between two system segments and provides a common data reference for the segments.	Used for major programs having various system segments. Used in lieu of including interfacing data in the CI specification. Prepared during system definition phase and updated during acquisition with final at CDR.

DID NUMBER, TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE

Section 4. CPCI Specification DIDs (cont.)

NOTE: A choice must be made concerning the use of DIDs in this section. On a given contract either E-3119B and E-3120B should be used as a set OR E-30113 and E-30110 should be used as a set for documenting CPCIs. Both sets should never be used on the same contract. Additionally, for any given CPCI, E-30130A should never be required if a CPCI will also be documented using one of the above mentioned sets. This would be duplicative since E-30130A is a combined B and C spec equivalent that is used in place of two formal specs. It is permissable to have E-30130A and a set of the other DIDs on the same contract, just not for the same CPCI.

E-3119B Computer Program Development Specification MIL-STD-483 + Notice 2	Establishes the performance, design, development and test requirements for a CPCI.	Establishes the performance requirements which the CPCI must satisfy upon completion of the development phase. Required for each CPCI allocated from the system, or higher level configuration item, specification. Normally prepared as Part I of a two-part specification.
E-3120B Computer Program Product Specification MIL-STD-483 + Notice 2	Establishes the detailed technical description of a CPCI to be delivered under the terms of the contract.	Establishes the product baseline for a CPCI. Normally prepared as Part II of a two-part specification. In case of conflict Part I will always take precedence over Part II.
E-30113 Computer Program Development Specification MIL-STD-483 + Notice 1	Establishes the interface, performance, design, development, and test requirements for each Computer Program Configuration Item (CPCI) to be developed under the terms of the contract.	CPCI development specification is required for each CPCI allocated from the system, or higher level configuration item, specification which establishes the functional baseline. Also required for non-system CPCIs.
E-30110 Computer Program Product Specification MIL-STD-483 + Notice 1	Establishes the detailed technical description of the computer program configuration item (CPCI) to be delivered under the terms of the contract.	Used to describe the method of fulfillment of the contractual requirements for the CPCI. Establishes the product baseline for a CPCI.

DID NUMBER TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section [illegible] CPCI Specification DIDs (cont.)		
[illegible] A Non-Complex Computer Program Specification MIL-STD-483 + Notice 2	Establishes the performance, design, development, test and detailed technical documentation of a CPCI.	Delivered CPCI must meet the design requirements of the specification. Design must be sufficiently documented in the specification to tell if all the design requirements have been met. This DID should be used for computer programs considered to be of a relatively non-complex nature (e.g. automatic test equipment, ground support diagnostics, simulators). NOTE: Can also be used when the formal A,B,C spec flow-down is not required or appropriate.
Common Data Base Design Specification MIL-STD-483 + Notice 1	Used to provide a description of all data items necessary to carry out the functions of the computer program.	Based upon the Computer Program Development Specification, developed in accordance with the Computer Program Product Specification. Common data is data required by two or more subprograms. Examples of common data are constants, indices, flags, variables, and tables. NOTE: Block 7 references E-30139 & E-30140 which have been rescinded. Can be used with E-3119B & E-3120B or E-30130A or with E-30110 & E-30113.

DID Number TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section D. Software Configuration Management Related DIDs		
A-3020B Contract Change Proposal/ Task Change Proposal MIL-STD-483 + Notice 2	Used to propose, control and approve changes to contractual requirements other than those contained in specifications and/or drawings (e.g. SOW, contractually imposed plans, CDRL).	Designed for system or equipment programs but can be used for any procurement involving "level-of-effort" tasks, studies, development or production. Procedures for processing must be agreed to by both the contractor and the procuring agency.
A-3127A Advance Change/ Study Notice (ACSN) MIL-STD-483 + Notice 2	Used for management and cost control of contract efforts relative to generation of ECPs and TCPs. Provides the responsible technical office with advance information that is used to determine the need for the proposed change action.	Applicable only if ECP or TCP data requirements are incorporated in the same contract. NOTE: See A-3020B.
B-3128 Engineering Change Proposals (ECPs) MIL-STD-483 + Notice 2	Used to prepare, process, and incorporate Class I Engineering Changes to the applicable contract baseline. Used to analyze the performance/time/cost benefits of proposed changes to CPCIs.	Proposed changes to each configuration baseline require formal approval by the Government subsequent to the establishment of that baseline.
B-3129 Request for Deviation/Waiver MIL-STD-480, MIL-STD-481A	Used to accept a configuration item or other designated items, which during production or after having been submitted for inspection, are found to depart from specified requirements but nevertheless are considered suitable for use "as is" or after rework by an approved method.	No guidance in application block of DID. NOTE: Should be used very carefully for CPCIs as non-conformance normally requires correction.

DID Number and Short Title / DOCUMENT	DESCRIPTION	GUIDANCE
Section E. Software Configuration Management Related DIDs (cont.)		
E-3126 Computer Program Identification Number Air Force Computer Resource Inventory Data MIL-STD-483 + Notice 2	Provides the data for establishing a CPIN for all CPCIs and related documentation.	Satisfies requirements of MIL-STD-483, Appendix IX. CPIN request must be made prior to Critical Design Review (CDR) for each CPCI.
E-3121 Version Description Document (Computer Programs) MIL-STD-483 + Notice 1	Sets forth the exact version of a CPCI and interim changes thereto. Used to identify the current version and accompanies each version of a CPCI and each release of an interim version change.	Part of an integrated approach to configuration management of CPCIs in accordance with Appendix VIII of MIL-STD-483.
E-3134 Specification Change Notice (Computer Program) MIL-STD-483 + Notice 1, MIL-STD-490 + Notice 2	Identifies a proposed change to a contractually applicable specification and after approval, provides a record of the change and the associated ECP.	Guidance same as E-3121.
E-3122 Configuration Index MIL-STD-483 + Notice 1	Provides current status information concerning changes (ECPs) to specifications, test plans, handbooks, manuals, and version description documents.	Guidance same as E-3121.
E-3123 Change Status Report (Computer Program) MIL-STD-483 + Notice 1	Details the status of all proposed changes to a CPCI for which the contractor is responsible and for which existing documentation is listed in the Configuration Index.	The Change Status Report is supplementary to the Configuration Index.

DID NUMBER/TITLE	SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section 6. Miscellaneous Commercial/Off-the-shelf Software Documentation DIDs			
A-5027 Commercially Available Computer Data TBD		Provides a complete listing of all readily available software items or programming aids and other data associated with the hardware items being considered for purchase or lease.	Defines software and data by specific title.
M-5085 Commercial Computer and Peripheral Equipment Manuals MIL-M-7298C(2)		Provides information for the installation, operation, and maintenance of the equipment.	The contractor's published listing of available manuals are to be used to determine the types of manual to be required to support the equipment.
A-5398 Contractor Notification of Changes to Commercial Equipment TBD		Gives instructions to contractor for informing the Government when in-line manufacturing changes are made to equipment and/or software.	Allows Government to evaluate each change for its effect on in-use equipment and software in relationship to future buys, in-system interface, and improvement updating.
M-5110B Computer Ancillary Equipment Programming Aids (Software) and Manuals TBD		Provides contractor-prepared programming aids and documentation for use of operating, programming, systems, managerial, and programmer trainee personnel.	Software programming aids for use with existing executive system with custom modifications. NOTE: Will normally require tailoring because the DID lists punched paper tape as the delivery medium. Suggest deleting delivery medium requirements and using B-30145 to effect delivery of physical program or modify the DID to effect a different delivery medium.

DID NUMBER / TITLE	SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section 3. Miscellaneous Software Documentation DIDs (cont.)			
M-3410 Users Manual (Computer Program) AFSCM 375-7		Provides instruction concerning use of a CPCI and how it is to be operated. Content and format shall be specifically designed to meet the needs of the intended user.	Applicable to systems containing CPCIs. Basis for development of the Users Manual is the Computer Program Development and Product Specifications. Usually delivered at PCA.
M-3409 Positional Handbook - Information System Operational Personnel TBD		Describes operating procedures for consoles used to support the system in accomplishing its prime mission.	Applied to contracts where computer based information systems are involved. Positional handbooks are used by operational personnel operating the consoles and related equipment.
M-30419 User's Manual (Computer Program) AFR 800-14		Used to provide Air Force and/or contractor personnel instructions for operating and using CPCIs.	Applicable to systems which contain computer program CIs. NOTE: This DID was designed for use with E-30139 and E-30140 which have been rescinded; can be used with E-3119B & E-3120B or with E-30130A or with E-30113 & E-30110.
M-30421 User's Manual (Information Systems) MIL-STD-483 + Notice 1		Provides the user's non-ADP personnel with information necessary to effectively use the system.	Gives concise description for usage of computer programs in an operational environment.

DID NUMBER/TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section 5. Miscellaneous Software Documentation DIDs (cont.)		
R-5131 Computer Maintenance Diagnostic Program IBD	Used to test general purpose computer systems.	The diagnostic package covers three areas: operational software system, maintenance, and operations. NOTE: May need to buy a User's Manual also.
M-30422 Maintenance Manual (Computer Program) MIL-STD-483 + Notice 1	Provides maintenance programmer personnel with information necessary to effectively maintain the system.	Highlights and/or complements the CPCI specification Part II (C5).
DI-DI-E-30445* Firmware Maintenance Manual AFS 800-14	Provides programmers/engineers with the necessary information to maintain, adapt, and update embedded firmware. Describes the design of hardware, software, interfaces, and support equipment and the restrictions imposed by them on the modification of the embedded firmware.	Use when government modification or maintenance of commercially developed firmware is required. Normally used in conjunction with the CPCI Specifications and the Interface Specification.
A-3027 Data Accession List/Internal Data IBD	Provides a list of all internally generated contract data that may be available upon request.	Used on R&D type contracts to facilitate the identification of internally generated data that is usually not determinable at the outset of a contract NOTE: In general, usable on any kind of contract.
M-4415 Catalog and Glossary of Computer Program and Programming Documentation MIL-T-9941(3)	Used by all levels of technical, administrative, and management personnel as a ready reference for all topics and volumes of documents which describe the system.	Applicable to contracts which acquire voluminous program and programming documentation. Usually prepared by prime or integrating contractor and delivered at PCA.

DID NUMBER/TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section 8. Requirement Allocation and Software Design DIDs		
S-3604 Functional Flow Diagram MIL-STD-499A	Initial step in system engineering process. Represents a block diagram of the functions which must be met to satisfy total system needs and so represents the genesis of subsequent detail requirements determination. Functional block diagrams are drawings to be approved and released internally within a contractor's facility.	Used only if the acquisition involves a multi-contractor relationship and there is a need for commonality of the data among the contractors.
S-3605 Requirements Allocation Sheets MIL-STD-499A	Used to translate functions into design requirements.	Same as S-3604.
S-3607 Schematic Block Diagram MIL-STD-499A	Basis for displaying functional and technical requirements and interfaces. Supports the design synthesis integration, and interface compatibility functions.	Same as S-3604.
S-3608 Time Line Sheets MIL-STD-499A	Used to support trade studies for optimization of functional mappings to hardware or software. Displays the length of time, personnel required and task sequencing required to accomplish a function plus the appropriate function start time.	Same as S-3604.
S-3606 System Design Trade Study Report MIL-STD-499A	Documents the decision and rationale for designated trade studies. May involve a variety of engineering techniques and can be accomplished at any level. As appropriate, will document results of system effectiveness, life cycle cost, and risk analysis.	Trade studies are accomplished at various points in the acquisition cycle; not limited to any one program phase; specific studies and reports are specified by the procuring activity.

DID NUMBER/TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE	
Section 9. Software Delivery DID			
F-30145 Computer Software/Computer Program/ Computer Data Base Configuration Item(s) MIL-STD-483 + Notice 1	Defines preparation requirements for computer software/computer program/ computer data base media.	Applies to all computer software/computer program/computer data base configuraton items.	
Section 10. CPCI Test Related DIDs			
NOTE: The following DIDs form two sets of test related DIDs. One set or the other should be used, but not both, on any given contract. The set of three one time (OT) DIDs is recommended over the set of standard DIDs in order to facilitate separate delivery of test plans and test procedures.			
OT-DI-E-30154* CPCI Test Plan	Establishes detailed qualification requirements, criteria, general methods, responsibilities, and overall planning for the DT&E qualification of CPCIs.	A draft DT&E CPCI Test Plan is normally submitted after the Computer Program Development Specification (CPDS) is authenticated but before PDR. Test Plan must be approved before CDR. Test plan based on section 4 of CPDS. Used in lieu of T-3703A, CPCI Test Plans/ Procedures.	1
OT-DI-E-30153* CPCI Test Procedures	Establishes detailed test conditions, required inputs, expected results, test operating sequences/instructions and data reduction/analysis procedures for each individual qualification test involved in the DT&E of a CPCI.	Test procedures are submitted after Government approval of the DT&E CPCI Test Plan, OT-DI-E-30154. Separate submissions for PQT and FQT. Used in lieu of T-3703A, CPCI Test Plans/Procedures.	1
OT-DI-E-30155* CPCI Development Test and Evaluation Test Report	Used to report results of PQT and FQT for a CPCI.	Separate submissions for PQT and FQT. Used in lieu of T-3717A, CPCI DT&E Test Report.	1

*These DIDs are ESD unique, consequently they are not stocked by NPFC. Only the DID Numbers were changed, the content was not changed. See NOTE 2 on page II-35.

DID NUMBER/TITLE/SOURCE DOCUMENT	DESCRIPTION	GUIDANCE
Section 10. CPCI Test Related DIDs (cont.)		
T-3703A CPCI Test Plans/Procedures MIL-STD-483 + Notice 1, MIL-STD-1521A + Notice 1, AFR 80-14, AFR 800-14	Establishes detailed qualification requirements, criteria, general methods, responsibilities, and overall planning for the DT&E qualification of a CPCI	Plan normally obtained separate from procedures during validation phase. Procedures normally obtained in the design and development phase. NOTE: It is recommended that E-30152 and E-30153 be used in place of this DID in order to facilitate separate delivery of test plans and procedures.
T-3717A CPCI Development Test and Evaluation (DT&E) Test Report AFR 80-14	Used to report the results of an individual DT&E preliminary or formal qualification test for a CPCI and to report a summary of the total DT&E process.	Serves as the major link between the end of CPCI DT&E and the start of system DT&E testing.
T-3718A Test Reports, General AFR 80-14	Provides the results of development and qualification tests required and to show degree of meeting specified performance objectives. Used primarily to document unit tests for a computer program.	Applicable whenever success criteria and test methods have been prescribed. Applicable both flight and ground tests.

Figure II-4-2. Computer Resources CDRL Checklist

1. Insure adequate software documentation is required for the particular system being procured.

2. Check for consistency of requirements of the CDRL entries with the SOW. Every CDRL item must be tied to a specific SOW task. Ensure reference is to correct SOW paragraph.

3. Check delivery dates of software related DIDs and make sure they are reasonable (e.g., Part I Specifications delivered about 60 days prior to Preliminary Design Review (PDR), Partial Draft Part II Specifications delivered about 60 days prior to Critical Design Review (CDR), Computer Program Identification Numbers requested prior to CDR, Draft CPCI Test Plan submitted prior to CDR, and CPCI Test Procedures submitted after Government approval of Test Plan).

4.(M) As a minimum, have the following Data Item Descriptions (DIDs) been included in the CDRL:

a. Appropriate DIDs for computer program specifications (e.g., Part I and Part II, B and C, and/or non-complex CPCI Specifications) (DI-E-3119B and DI-E-3120B most common)

b. Computer Program Development Plan (CPDP) (usually DI-S-30567A)

c. Software Quality Assurance Plan if a separately deliverable item (may be included in CPDP or overall QA Plan) (usually DI-R-3521)

d. Actual CPCI/Software end items (e.g., DI-E-30145)

e. Version Description Document (DI-E-3121)

f. Specification Change Notice for computer programs (DI-E-3134)

g. Computer Program Identification Number (CPIN) Request (DI-E-3162A)

h. CPCI Test Plans, Procedures, Reports (OT-DI-E-30152, OT-DI-E-30153, and OT-DI-E-30154 are recommended).

Section 5. Development of Source Selection Plan (SSP)

5-1. Review other SSPs for guidance in preparation (contact the ESD Source Selection Secretariat at Waltham).

5-2. Review the Source Selection Secretariat Handbook which explains the Source Selection Process.

5-3. Review AFR 70-15 Source Selection Policy and Procedures (Para 2.2) which describes SSP content, preparation, and minimum requirements.

5-4. Assist with draft SSP and insure it contains the approach and Government organization, plus criteria and schedule for proposal evaluation and contractor selection.

5-5. Insure draft complies with PMP directions regarding source selection.

5-6. Coordinate draft with SSEB membership.

5-7. Coordinate final SSP for approval by Source Selection Authority (SSA).

Section 6. Evaluation Criteria

6-1. Review AFR 70-15 (Source Selection Policy and Procedures).

6-2. Review Source Selection Plan for identification of the evaluation criteria.

6-3. Insure software evaluation criteria covers all significant requirements in the System Specification, SOW & CDRL.

6-4. Are all software criteria known to the contractors? Insure proposals will not be evaluated against criteria unknown to the contractors.

6-5. Insure each criterion includes a reference to the corresponding requirements in the RFP package.

6-6. Insure Standards of Evaluation are also prepared for evaluating the criteria.

6-7. Are the software criteria detailed enough to require a "how" answer instead of a restatement of the requirement by the contractor?

6-8. Has a risk analysis of the software requirements been performed? Will it be used in guiding the evaluation process?

6-9. Are software criteria written to evaluate the contractor's abilities to meet the contract requirements?

6-10. Do software criteria exist that will discriminate between the best contractors?

6-11. Are software cost criteria realistic? Are they based on reliable estimates?

6-12. Insure the complete set of management evaluation criteria covers all management information required by the CPDP.

6-13. Review Figure II-6-1, Sample Computer Resources Evaluation Criteria.

Figure II-6-1. Sample Computer Resources Evaluation Criteria

The following evaluation criteria were taken from a sampling of actual evaluation criteria used at ESD. Twenty-three catagories of evaluation criteria are given.

A. Configuration Management

1. Is Configuration Management properly coordinated with SQA?
2. Is software configuration management a part of Software Quality Control?
3. Is Library Control properly coordinated woth Configuration Management?
4. Does the company provide a list of authorized signatures for configuration control?
5. Does configuration status accounting comply with MIL-STD-483?
6. Are configuration status reports provided on a regular basis?
7. Does the company exhibit a written Software Configuration Management Policy?
8. Is this policy applied to all software projects?
9. Are software representatives present on hardware CM boards?
10. Does the contractor provide for government representation on CM boards?
11. Are hardware representatives present on software configuration boards?
12. Does the company present a sample Configuration Management plan?
13. Is a form provided for software change proposals?
14. Is a form provided for software trouble reports?
15. Is a form provided for software change reports?
16. Is a form provided for software trouble analysis?
17. Is a matched document tracking procedure used?
18. Are configuration status reports submitted on a regular basis?
19. Are software change approval forms used?
20. Does each required CM board meet on a regular schedule?
21. Is the configuration management office properly staffed?
22. Are EAM/MIS techniques utilized for configuration status accounting?
23. Is software configuration authentication properly provided for?
24. Are provisions made for adequately numbering and identifying software products?
25. Are inter-relationships between software and hardware CM clearly defined?
26. Does the company adequately provide for the assurance that approved changes are implemented?
27. Does the configuration procedure adequately describe interface management?
28. Does the company exhibit evidence of an ongoing software configuration control program working successfully on previous projects?

B. Software Quality Assurance/Software Quality Control

1. Does the company present a written SQA Policy?
2. Does the company present an SQA plan which they would apply to this project as part of the CPDP?
3. Can the company present evidence that their QA is working successfully on other projects?
4. Does the SQA plan clearly delineate levels of authority and show key contact personnel?

5. Does the company exhibit a Library Control Doctrine and/or Library 'ops' manual?
6. Are the two types of required software library clearly distinguished?
7. Are Master Programs always initiated on new certified storage media?
8. Are 'working media' kept separate from Master baseline files?
9. Are library transaction records maintained?
10. Are library personnel qualified as librarians?
11. Does the company have a procedure for work certification?
12. Does the company present a written testing policy and doctrine for software?
13. Does the test engineer function as part of the design team?
14. Is the test engineer a 'third party independent functionary' of the SQA department working with the design team?
15. Does the company have an assigned group which does software trend analysis?
16. Does the company adhere to the 'Top Down' testing approach?
17. Does the company's formal review process adequately address the S/W issues?
18. Is the same level of control (SQA) exercised over 'non-deliverable' as 'deliverable' SW?

C. Software Development

1. Are the contractor's support software and tools (compilers, etc.) adequate for this project?
2. Will the contractor give the Government full license for all support of software used?
3. Is the contractor's support software under Navy Configuration Management?
4. Does the contractor have a software 'specification writing' department/division?
5. Is the company experienced in writing Military S/W spec. for embedded computers?
6. Is a qualified mathematician operating as part of the spec group?
7. Does the company advocate the MIL-STD-490 Type 'A' approach to specification writing?
8. Does the company propose to develop interface design specifications in the initial specs?
9. Is the specification plan phase properly defined in the SDP proposal?
10. Is the 'Top Down' approach to specification writing advocated practiced?
11. Is the design approach proposed a true Top Down Hierarchical 'approach'?
12. Is a 'tree structure' design proposed for the PDS?
13. Are illegal design structures proposed?
14. Does the company utilize the 'lead programmer team' principle for designing software?
15. Is the Lead Team Programmer assigned to write the Program Design Specification?
16. Is the Assistant Lead Team Programmer assigned to write the Data Base Design?
17. Is the Lead Programmer fully qualified?
18. Is the team adequately staffed to perform efficiently?

19. Is the team greater than eight persons?
20. Is the team too small?
21. Are team channels of communications adequately defined?
22. Is team member work-scheduling adequately defined and documented?
23. Does team doctrine define procedures for updating and correcting team documentation?
24. Is the Lead Programmer a part of the CCB?
25. Does the team report to the proper level of authority?
26. Does team organization adequately provide for work scheduling and monitoring?
27. Are team activities and functions properly coordinated with the SQA division?
28. Does the team (or each team) have team operations manuals?
29. Do teams operate continuously on a number of scheduled projects?
30. Are teams chosen and selected as each project is developed?
31. Does the company prescribe a well formatted and defined project notebook?
32. Are project notebooks kept by the Lead Programmer?
33. Can the company show examples of project notebooks?
34. Are programmers notebooks kept?
35. Can the company show examples of 'programmers' notebooks?
36. Are menial tasks performed by the appropriate skill levels?
37. Do software designers do their own coding and keypunching?
38. Is coding done by team members from a pool of coders, (not team members)?
39. Does the company clearly indicate that coding will begin at the proper point in the development cycle?
40. Does the company call for use of PDL techniques?
41. Is the data base properly defined before module design begins?
42. Are data base designs sufficiently complete before module design begins?
43. Are all module designs submitted to the structured walk-through process?
44. Are structured walk-throughs adequately utilized?
45. Will the contractor allow the Government to view the structured walk-through?
46. Are minutes kept of the structured walk-throughs?
47. Are user manuals developed concurrently with system designs?
48. Are test plans initiated concurrently with program designs?
49. Is the test engineer a member of the SQA department working with the team?

D. Facilities Evaluation

1. Does the company own and manage their own computer facility?
2. Does the company use terminals which tie into large facilities (not company owned)?
3. Are working spaces for programmers adequate?
4. Does the company maintain separate libraries for documents and programs?
5. Is the software program library properly equipped?
6. Is the software library area air conditioned?
7. Are library storage areas overfilled and poorly kept?

8. Does the company maintain a ready stock of 'fresh', i.e., certified, magnetic tapes, paper, etc.?
9. Is general security adequate?
10. Is library security adequate?

E. Previous Experience

1. Is this company experienced in developing Real Times Applications software for embedded computers?
2. Has this company had experience with Government/Military contracts?
3. Has the company developed software utilizing MIL-S-52779?

F. Staffing

1. Is the Program Management staffed with a Senior System Programming Engineer?
2. Are the lead programmers PHds and/or System Engineers?
3. Are the assistant lead programmers staffed by MA degrees in Computer Science and related fields with 5 or more years experience?
4. Are the algorithm programmers BA degrees with 5 or more years experience (or equivalent)?
5. Are the programming language specialists equivalent to BA degrees with 3 or more years experience?
6. Does the test engineer have a BA degree and 5 or more years experience?
7. Does the clerical help for the lead programming team reflect good stenographic quality?
8. Are the librarian/library personnel qualified librarians?
9. Are Configuration Management Engineers qualified by a BA degree and 5 or more years experience (or equivalent)?
10. Are the SQA engineers experienced in QA and in software?
11. Are the Specifications Writers MA or PhD level of education with 5 or more years experience?
12. Is a senior Mathematician (PhD) available as part of the specification team?

G. Management

1. Does the company present a written Project Management (PM) Plan as an example?
2. Is a project manager designated or proposed to be designated for this project?
3. Are names and telephone numbers of key people made available through the PM Plan?
4. Is a clear description of 'workflow' presented in the Project Management Plan?
5. Are project management review procedures specified by the PM Plan adequate?
6. Does the company project management plan indicate that an established informal review process is working in this company?
7. Are formal project reviews held within the company as a matter of policy?
8. Are procedures for company reviews clearly spelled out in company documents?

9. Is a clear Work Breakdown Structure, matrixed to individual SOW tasks, presented?
10. Can the Work Breakdown Structure be adequately related to specific cost factors?
11. Is Work Load Analysis data collected and evaluated?
12. Does the management have adequate tools for monitoring cost trends?
13. Are milestones clearly identified in the project managers plan?
14. Is an Assignment Plan Responsibility Matrix with correct time phase relationship available and presented?
15. Is the project manager's relationship to other organizations defined?
16. Is the end product deliverable specifically identified in the project management plan?

H. Subcontractor Control

1. Does the contractor plan to subcontract this project software?
2. Does the subcontractor present a written set of specifications and standards for subcontracting software?
3. Are these specifications and standards in compliance with MIL-S-52779A?

I. Library Change Control

1. Does the company have a written set of Procedures for Library Change Control?
2. Are change pages on each document?
3. Is a current catalog maintained of all project software documentation?
4. Does this catalog provide for current configuration change status?
5. Are minimum classified security requirements met?
6. Does the library change control procedure clearly inter-relate with CM?
7. Is a stringent control of computer baseline documentation evident?
8. Is a 'matched document' receipt control procedure provided for all changes?
9. Is good traceability apparent?

J. Library Security

1. Are library security measures written and explained?
2. Are all libraries designated as limited access areas?
3. Are access control points designated?
4. Are library custodians named and designated?
5. Do library custodians have the proper level of security clearance?
6. Is a library authorized access list maintained?
7. Is a log maintained of all access to the library area?
8. Are safes/safe doors, maintained?
9. Is fire control adequate?

K. Document Library Facilities

1. Does the company have a separate technical library?
2. Will a specific section of the technical library be dedicated to this project?
3. Are storage areas and shelves adequate?
4. Is lighting adequate?
5. Are security safes available for classified material?
6. Is the library within reasonable proximity to the users?

L. Computer Library Facilities

1. Does the company have a computer program library?
2. Does the company have adequate storage facilities for magnetic tape media, etc.?
3. Are 'safe' areas designated for master tape storage?
4. Are fire protection facilities adequate?
5. Are computer terminals available for off-line storage?
6. Are 'working media' kept separate and distinct from baseline tapes?
7. Is the library within reasonable proximity to the working area?
8. Are 'scratch' tapes kept separate from working tapes and master tapes?
9. Does the library have good magnetic tape cleaning and repair facilities?
10. Is the storage area air conditioned with humidity control?
11. If 'off-line storage' is used, are the same quality factors present for the storage facility?

M. Software Quality Control Auditing

1. Are written SQC Informal Auditing procedures presented?
2. Are SQC personnel permitted to review structured walk-throughs?
3. Are regular SQC Audits made?
4. Is an SQC Audit Certification Report Form available?
5. Is SQC given a full set of all project relevant Policies, Plans, Practices and Procedures?
6. Does SQC have access to all relevant and required files and records?
7. Does SQC have an SQA Audit Stamp?
8. Do all files contain an SQC Audit Record showing date and auditor?
9. If a formal written procedure available for formal SQC Audits?
10. Are formal minutes of audits kept in SQC/A Files?
11. Are action items properly flagged, and tracked?
12. Are SQC members present at all formal Technical Reviews?
13. Are formal agendas published in advance?
14. Does the routing reflect the proper organization structure?

N. Software Quality Assurance Support Tools

1. Are "tools" described for performing "Operations Research" and "Systems Analysis" of the performance of software development groups?
2. Are techniques described which augment analysis of functional and performance requirements?
3. Are "tools" described which augment analysis of functional and performance requirements?
4. Are software optimization tools available and utilized?
5. Are tools and procedures available which would verify specification traceability?
6. Does the contractor have a "Coding Conventions" manual?
7. Are any or all of the above documents available for examination?
8. Are the manuals cited that are available for examination certified by an SQA Stamp?
9. Is clear evidence available which would verify that the tools have been previously developed and are normally utilized?

10. Are tools other than those mentioned in this reference section?
11. Are the additional tools valid?
12. Do the SQA support tools described adequately meet the requirements for SQA support?

6. Certification

1. Is a written certification procedure made available to the evaluator?
2. Does this procedure reflect good SQA Policy?
3. Is the certification procedure valid?
4. Is the certification done by independent parties?
5. Are good certification standards developed for each project?
6. Is a Quality Certification Stamp utilized?

7. Testing

1. Is a testing policy which is written and explained, available to the evaluator?
2. Is 'Top Down' testing practiced as a policy by this company?
3. Are test plans and procedures initiated during the specification phase?
4. Are all test plans and procedures routed to SQC for approval?
5. Are the three types of testing properly identified?
6. Are provisions for continued updating of test plans and procedures made?
7. Are all tests done by independent parties?
8. Is test result feedback reporting adequate?
9. Will logs and records be maintained by test personnel?
10. Are testing goals and objectives identified?
11. Are good certification testing procedures established?
12. Is final certification testing to be done by an independent group?
13. Is reporting of test records, test reports, and test results as proposed by this company adequate?
14. Will complete system tests be re-activated after each trouble correction?

8. Corrective Action

1. Will trouble reports be utilized?
2. Will all troubles found be duly recorded in a project logbook?
3. Will trouble reports be routed to SQC, PM, and other relevant company officers?
4. Is good feedback reporting evident in this descriptions of their policy for software corrective action?
5. Will software designers utilize trouble analysis reports to 'upgrade' the quality of the final product?
6. Are trouble analysis reports to be submitted to peer appraisal via the structured walk-through?
7. Are all ECAs listed serially on developmental listings of computer programs?
8. Are troubles to be reported to the Configuration Management Group?
9. Are trouble corrections to be properly reflected in ECRs, ECPs and ECAs?

R. Product Evaluation

1. Does the company present a written Product Deliverable Policy?
2. Does the company perform an internal functional Configuration Audit of the deliverable?
3. Does the company perform a Physical Configuration Audit of the deliverable?
4. Does the company certify each program tape on new certified media?
5. Are final printed material subcontracted to a commercial printing company?
6. Are final printed materials done by a company owned printing facility?
7. Are complete baseline records maintained by the company for the legal time requirement (7 years)?
8. Are final printed material presented in quality bindings?
9. Are final printed material in a professional bold face type (not typewritten)?
10. Do final printed materials comply with the standards and specifications?
11. Do all final deliverable copies provide for a Quality Certification Stamp?
12. Does the company guarantee that deliverables made on this project will meet the company's highest standards?

Section 7. Source Selection Evaluation Board

7-1. Review AFR 70-15 Source Selection Policy and Procedures.

7-2. Prepare software/hardware source selection criteria.

7-3. Participate in preparing the computer system detail standards.

7-4. Review each offeror's proposal from a software viewpoint.

7-5. Review the CrDP submitted with the proposal.

7-6. Assess each proposal against the standards and criteria previously established.

7-7. Fillout the evaluation work sheets.

7-8.* Prepare Item and Factor summaries as appropriate.

7-9.* Prepare Clarifications/Deficiencies.

7-10.* Prepare Points for Negotiations.

7-11.* Evaluate response to Clarifications/Deficiencies.

7-12.* Prepare Final Item & Factor Summaries.

7-13. Participate in negotiations.

7-14. Provide debriefing inputs.

7-15. Provide SSEB and SSAC report inputs.

7-16. Assist in SSEB briefings to SSAC and SSA.

*NOTE: Some procurements may vary from this to a degree.

Section 8. Computer Program Development Plan

8-1. Review CPDP Data Item Description (DI-S-30567A).

8-2. Review other program CPDPs for appropriate DID modifications.

8-3. Prepare changes to the CPDP DID to be provided as backup to the CDRL. Tailor to this particular program. (See attached model backup sheet)

8-4. Insure the CPDP meets requirements in the AFR 800-14, Vol II, Section 3-3.

8-5. Insure the CPDP follows the guidelines set forth in ESD-TR-77-263, Software Acquisition Management Guidebook, Verification, Para 2.3.1.

8-6. Insure that the CPDP is delivered with the proposal and made part of the contract.

8-7. Insure that the CPDP is put in the SOW and in the CDRL.

8-8. Review the Computer Program Development Plan Checklist, Figure II-8-1.

Figure II-9-1. Computer Program Development Plan (CPDP) Guide/Checklist

Definition: The Computer Program Development Plan (CPDP) is a document in which the contractor describes his specific detailed plan for the management and development of all of the computer programs and associated documentation that is needed for completion of the contract; this may include support software such as simulations and analysis tools, as well as operational programs and automatic test equipment programs. (Source: DID DI-S-30567A)

General

1. If the contractor uses his own format, is there a cross reference between the CPDP and the items outlined in the DID (DI-S-30567A) Paragraph 10.1?

2. Does the CPDP show the prime contractor's organizational structure to include his program office for the subject contract?

3. Are all of the subcontractor's organizational responsibilities and structural relationships to the prime contractor's program office clearly identified?

4. Does the contractor provide for traceability control from the A-Specification through the C-Specification?

5. Is the SQAP incorporated into the CPDP? (If the answer is yes, use the SQAP checklist, Figure II-9-3, in conjunction with this list.)

6. How are you using the CPDP to manage the development effort at both the contractor and Government levels? How are you as a Government activity tracking the software development using the CPDP provided by the contractor? Are any of the management tracking functions delegated to the AFPRO or DCAS offices?

7. Is the CPDP current?

8. Are TIM meetings (Technical Interchange Meetings) provided for in the CPDP?

9. Are there any restrictions in rights which may preclude delivery of software maintenance or other tools to the Government?

10. Are procedures and criteria for determining software development progress described?

11. Do the SQA procedures provide for the review of software documentation?

12. Are system integration studies to be performed?

13. Do the SQA procedures assure the conduct of design walk-throughs?

14. Does the SQA program contain procedures to identify conflicting requirements?

15. Does the test program include provisions to stress test computer equipment and computer program configuration items?

16. Is firmware treated as software?

17. Does the plan allow for unscheduled audits?

18. Are formal qualification test(s) required to verify CPCI performance against the development specifications?

Requirements Assessment Summary

19. Does this section show the contractor's understanding and assessment of the completeness and clarity of:

a. Computer resource requirements

b. Definition of the hardware and software configuration items and their interfaces

c. Current functional allocation

d. Sizing and timing analysis in order to meet reserve memory requirements

20. Is there a summary of high risk and uncertainty issues (i.e., technical, cost, schedule)?

21. Does the contractor identify proprietary computer resources and other used-as-is or modified-and-used computer resources to be used during the contract including subcontracted resources?

22. Are there approaches with backup alternatives to minimize or overcome the risk and uncertainty issues?

23. Is the risk involving long-lead items and their status identified?

24. Are trade and optimization studies yet to be conducted and their relationship to the computer resources identified?

25. Is the rationale for the selection of the computer programming language(s) if not specified or if different from that specified identified?

26. Are subcontract items and who will be performing the subcontract work identified?

Project Objectives

27. Are allocation functional requirements for each computer plan clearly identified for each CPCI. Does their statement for each Computer Program Configuration Item (CPCI), per MIL-STD-483 identify the planned allocation of its functions and interfaces?

28. For each CPCI are there budget goals for timing memory, interface, and channel capacity (including redefinition, when required, based on the contractor's approach) and margins for growth in these capacities both during development and future operation?

29. Are factors such as reliability, maintainability, testability, efficiency, portability, interoperability, and other factors from a technical approach discussed?

Work Definition

30. Does the CPDP provide for a feasible work breakdown structure for accomplishing the development effort of the computer program development effort? (Recommend a 3 level breakdown structure for tracking software development.)

31. Does the plan identify the necessary development steps such as analysis, design, coding, checkout, integration, test, acceptance delivery for each CPCI and major supporting computer resources and their relationship to the contractor's Work Breakdown Structure (WBS) per MIL-STD-881, including required WBS deviations?

32. Are tasks associated with support functions (such as documentation, configuration management, data management, management reviews, software quality assurance), and their relationship to other contractual tasks identified?

33. Are tasks involving integration and test of CPCIs, including such factors as separate test configurations, system tests, and operational tests where applicable identified?

34. Are major development steps for all identified Computer Program Components (CPCs) in each CPCI, and all elements of the required computer resources which support the product identified?

Work Schedule

35. Does the plan provide a time schedule of the work elements, based on the contract master schedule, indicating initiation, intermediate (e.g., availability of draft and final copies for formal and informal documentation) and completion times for all CPCIs and time/performance critical Computer Program Components (CPCs) including formal and informal milestones, reviews, audits, key meetings, and documentation releases?

Activity Network

36. Does the contractor provide an Activity Network (e.g., PERT) compatible with the Work Schedule of computer program development efforts?

37. Are interface activities (such as hardware development) addressed as part of the Activity Network?

38. Are critical paths or near critical path elements identified?

Organization

39. Does the contractor provide for delineation of the contractor's organizational structures, authorities, responsibilities, interfaces, skill requirements and lines of communications necessary to manage and execute the scheduled activities to assure proper task completion?

40. Are the relationships between the contractor and independent or redundant verification and validation groups, other contractors, subcontractors, the procuring agency, the support agency, and the user agency identified?

41. Are key skilled managers and employees identified by name?

Resource Allocation

42. Does the contractor provide for allocation of facilities, laboratories, computer time, test equipments, and other relevant resources against or integrated with structures, work elements and schedules?

43. Does the contractor identify project-peculiar resources required, such as special purpose hardware and computer programs, Government-furnished items, critical data, etc.?

44. Does the contractor identify items which may impact resources, such as high risk development items, special security requirements, subcontractor involvement, etc.?

45. Is there a presentation of the methods to be used to assure compatibility of the procured systems with the intended operational physical facilities?

Engineering Standards

46. Does the contractor provide a definition or identification of software engineering practices as they apply to each CPCI and computer resource support program?

47. Does the contractor identify how these practices will be maintained or how compliance will be assured?

(Examples of engineering practices: standards, conventions, procedures, and rules for program design, structures, display and logic standards, input/output standards, guidelines for program sub-division, coding techniques, and programming languages, data base standards and other disciplines affecting development)

Design Assurance Techniques

48. Does the contractor provide a definition of the techniques used for design analysis and control to assure completeness, validity traceability to requirements, testability and compliance with standards and practices?

49. Does the contractor(s) explain his approach to preliminary and critical design reviews?

50. Does the contractor define what he means by design evaluation techniques and an identification of the purpose, application, and validity of the tools used (i.e., computer resource support products, simulations, prototypes, mathematical models, and emulations)?

51. Does the contractor show identification of verification and validation techniques and aids and how they will be qualified and used during the entire development process?

52. Is there a statement of the plan for defining, managing, controlling, and reporting the status of budgets on timing and memory, and technical interfaces and interface margins? Are guidelines and checkpoints for insuring future computer program growth capability, modularity, and ease of modification adequately identified?

Detailed Design, Coding, and Checkout

53. Does the contractor provide a definition of the procedures, steps and documents associated with detailed design, coding checkout, review and acceptance of the individual modules comprising CPCs and CPCIs including the functions performed, the handling of the internal and external interfaces, the control of parameters? (i.e., memory allocations, execution time allocations, channel requirement allocations, operating sequences, data base requirements and test requirements).

54. Does the contractor identify computer programs, equipment and devices required to support system computer hardware and to facilitate software changes, including diagnostic software for all computer resources?

55. Does the contractor identify criteria and the mechanism for acceptance of modules for integration and test?

Development Test and Evaluation

56. Does the contractor provide a presentation of the integration and test philosophy and approach for CPCs and CPCIs?

57. Does the contractor explain how this philosophy is applied in the design and scheduling, and how the approach leads to the Preliminary and Formal Qualification Tests?

58. Does the contractor provide a definition of the interfaces and responsibilities (such as training) among test groups and other project participants?

59. Does the contractor show the resource and schedule impact of independent verification and validation activities?

System Test and Evaluation

60. Does the contractor explain procedures for the coordination and support of CPCIs and other computer resources during formal system testing (and during Operational Test and Evaluation as applicable)?
61. Does the contractor include the necessary system training and transfer of data as part of the system test and evaluation information?

Anomaly Control

62. Does the contractor explain the methods or system by which computer software anomalies are detected and documented during all test and evaluation?

63. Does the contrator give the methodologies of error correction and configuration control? Does he identify who is responsible for such methodologies?

64. Does the contractor explain the data to be gathered to enable assessment of the reliability of the computer resources, reporting periods, data sources, and method to establishing when each anomaly (i.e., design, coding, test, etc.) was detected and corrected?

Management Controls

65. Does the contractor explain the relationships between the management controls of the CPDP and other applicable management plans? (i.e., Configuration Management, Security, and Systems Engineering Management Plan (SEMP)).

66. Does the contractor explain the means and criteria for management assessment and control of the development process? (Including subcontractors (i.e., mechanisms for initiating management actions when status dictates deviation from plan, such as resource reallocation, schedule slippage, cost overruns, or performance degradation).

Documentation

67. Does the contractor provide any new software documentation tools or a description of the contractor documentation practices including techniques intended for use on the subject contract?

68. Does the contractor identify the specific documentation alternatives and the necessary changes to the content and format of the specified documentation requirements? (Include as a minimum a description of the equivalency features between the specified documentation requirements and the proposed alternative(s)).

69. Does the contractor provide a description of the procedures which will be used to keep the informal documentation current?

70. Does the contractor provide a description of the approach to computer program in-line commenting?

Configuration Management

71. Does the contractor provide for the special aspects of computer software configuration management not addressed in the overall Configuration Management Plan? (Include the organizational placement, change, deviation, waiver authorization and control, internal engineering change board, configuration identification, computer program library control, the control or changes to any non-deliverable computer programs, the handling of interface changes between the hardware and the software of the system, maintenance of independent master card/decks/tapes/disks, control of development versions of CPCs and CPCI, handling of source and object code, control over test environments, relationship to programming standards, and relationship to software quality assurance functions).

Vendor/GFE Computer Resources

72. Does the plan state the procedures for qualifying and documenting the present adequacy and the adequacy for future use of vendor-supplied or GFE computer resources (hardware and software) and the means, such as testing, for accomodating revision of vendor-supplied computer resources?

Support Resources for the Deployment Phase

73. Does the plan provide for the recommended support philosophy and the resource requirements for use after the FSED phase? Does this section of the CPDP summarize or specifically reference the plan for the transfer of computer resources including support software and tools to the appropriate Air Force agencies?

Figure II-8-2. Computer Program Development Plan Backup Sheets

BACKUP SHEETS

Data Item DI-S-30567A
Computer Program Development Plan

The contractor shall substitute the following for Box 10 of the DID:

Detailed Requirements: The contractor shall provide the following information in the format specified below:

TABLE OF CONTENTS

CROSS REFERENCE TABLES: The tables shall trace the delivered CPDP to the data item requirements defined in System Specification XXX and the Statement of Work (SOW).

1.0 ORGANIZATIONS, SCHEDULES, AND RESOURCES

A. ORGANIZATIONS

(1) Show the prime contractor's organizational structure to include his program office for the subject contract.

(2) Show all subcontractor's organizational responsibilities and structural relationship to the prime contractor's program office.

(3) Show the structure and relationships within the software development organization. Describe the following areas:

(a) The specific responsibilities of each element of the software development organization.

(b) The number and allocation of personnel involved in the design, coding, testing, documentation, quality control and maintenance of all project software. The description shall include job titles, job descriptions, job responsibilities, skills required, and the relationships of each job position to others in the software development organization.

(c) The procedures for notification to the Principal Contracting Officer (PCO) that will be applied concerning personnel being phased into or removed from the programming organizational structure.

(d) How organizational independence of Software Quality Assurance (SQA) personnel will be achieved.

B. SCHEDULES

Provide a detailed schedule for the availability of computer hardware and for the development of software. This schedule will be a graphic representation of the detail development milestones, scheduled activities and deliverables. Indicate on the schedule the time allocated for the Government's review of software related data submissions. The schedule shall include the time allocated for each phase of computer program development (e.g., analysis, design, coding and checkout, etc.) by CPCI. If Government Furnished Equipment (GFE) is to be provided, indicate on the schedule when the GFE will be required.

C. DELIVERABLES/DOCUMENTATION

(1) (a) Propose a schedule for developing computer program documentation in preliminary, interim and final versions. Include in the schedule Government reviews and Technical Interchange Meetings (TIMs) to aid in transitioning from the preliminary documentation version.

(b) Describe a procedure to be used during the review period to resolve the Government's technical concerns.

(2) Describe the software documentation approach which will be followed to meet or exceed the requirements of MIL-STD-483 (USAF) for documentation of B5 and C5 specifications. If new software documentation tools or techniques are to be employed, provide a description of these tools and techniques and explain any restriction in rights which may preclude delivery of these tools to the Government. Discuss how this documentation approach will be consistent with the development approach in providing effective documentation of the software.

(3) Describe the approach to computer in-line commenting* including the time at which it is initially accomplished and the plan for maintenance. Include techniques for identifying changes included in each re-compilation/re-assembly of each CPCI.

(4) Describe the procedure for mapping of functional requirements to CPCIs.

NOTE: Insure approach is consistent with Paragraph 3.3.8 of System Specification in MIL-STD-483, Appendix VIII.

D. PROGRESS MONITORING AND STATUS REPORTING

(1) Describe the procedures and criteria for determining software development progress.

(2) Describe your approach to software development progress reporting.

(3) Describe your approach to identifying, reporting and resolving software development problems.

(4) Describe the methods and procedures for estimating collecting, analyzing, monitoring and reporting the sizing and timing of CPCIs.

(5) Describe the conduct of all internal project reviews.

E. CONTRACTOR's FACILITIES AND HARDWARE

(1) Describe the software development and maintenance facilities to be used in the development, testing, and maintenance of the computer programs.

(2) Identify all computer configurations including peripherals. State associated delivery dates.

(3) Identify all testing resources to be used to support computer program development and testing.

(4) Identify all software tools that are planned for use in the development of the computer programs. Indicate whether tools(s) are deliverable or non-deliverable and, provide a rationale why the development tool(s) are not deliverable, if applicable. List any restrictions in data rights for the software tools.

2.0 SOFTWARE DEVELOPMENT AND TESTING METHODOLOGY

For each of the software development and testing methodologies discussed below, the contractor shall identify whether he has past experience in the use of this methodology. The contractor shall distinguish between existing capabilities and those capabilities not yet developed which will be used on the subject contract.

A. GENERAL REQUIREMENTS

(1) Identify the proposed programming language and provide a rationale for its choice. If more than one language is proposed (e.g., assembly language is proposed for some subsegments), provide a rationale for the use of each additional language.

(2) Describe your approach to analyzing system requirements and deriving the detailed functional requirements.

(3) Describe any techniques/tools for allocation of requirements to hardware/software.

(4) Describe your approach for DOD security level controls and methods of implementing and maintaining ADP security plus any unique security problems or planned installation security requirements.

B. DESIGN

(1) Insure the use of top-down design methodology to be used in the design and implementation of the system. Describe any effect that the choice of language(s) will have on the proposed methodology.

(2) Describe how the proposed computer programming language conforms to the proposed methodology. If an automated translation tool will be employed to achieve this conformity, describe the tool and any data rights restrictions which may apply.

(3) Describe your approach to data base design and implementation. Also describe how data base compatibility will be maintained between HOLs and assembly language programs, if both are used.

(4) Describe your approach to conducting Preliminary Design Reviews (PDRs). If incremental PDRs are proposed, describe how they will be accomplished.

(5) Describe your approach to conducting Critical Design Reviews (CDRs). If incremental CDRs are proposed, describe how they will be accomplished.

(6) Describe your plan for ensuring modularity and ease of modification. Also include a description of the plan for controlling computer program growth, to keep it within any imposed limits.

C. CODE AND DEBUG

(1) Describe your approach to coding and debugging the software.

(2) Describe any progress monitoring/reviews.

(3) Describe any software development libraries to be employed.

D. DEVELOPMENT TESTING

(1) Describe your approach to unit level code testing.

(2) Describe the extent of in-plant testing including test planning, methods, documentation and reporting. The general procedures for reporting, monitoring and resolving program errors and deficiencies discovered during in-plant test should also be described.

(3) Describe the proposed method for insuring computer program test and evaluation (CPT&E) testing and verification.

3.0 SOFTWARE MANAGEMENT AND CONTROL

A. DESIGN AND DEVELOPMENT CONTROLS

Describe your Programming Support Library (PSL).

B. CONFIGURATION MANAGEMENT

(1) Describe facilities and procedures to be used to maintain configuration control, per MIL-STD-483 (USAF), during the software development to include error correction control during integration and test, as well as development.

(2) Describe facilities and procedures for configuration management to be used after first system acceptance, if applicable, per MIL-STD-483 (USAF).

C. MAINTENANCE

(1) Describe methods for in-plant and on-site maintenance of software and documentation.

(2) Describe the maintenance approach for all vendor supplied off-the-shelf software (operating systems and utility services).

D. SOFTWARE QUALITY ASSURANCE

Describe your Software Quality Assurance (SQA) Program.

USE SQAP CHECKLIST II-9-3.

Section 9 - Software Quality Assurance

1-1. Review MIL-S-52779A, Software Quality Assurance Program Requirements.

1-2. Review MIL-HDBK-334, Evaluation of a Contractor's Software Quality Assurance Program.

1-3. Review MIL-STD-1679 (NAVY), Weapon System Software Development. (If MIL-STD-1679 is used, care must be taken to avoid conflict with other contract requirements and MIL-Specs/STDs.)

1-4. Review the Memorandum of Agreement/Letter of Delegation Checklist, Figure II-9-1.

1-5. Review the Software Quality Assurance Self-Inspection Checklist, Figure II-9-2.

1-6. Review the SQA Plan Checklist, Figure II-9-3.

1-7. Review ESDP 74-1, Guidance for Applying MIL-S-52779A.

(NOTE: This Strawman is not an AFMCD coordinated nor staffed document.)

Figure II-9-1. Memorandum of Agreement/Letter of Delegation Checklist (MOA/LOD)

Below is a list of possible items for incorporation into an MOA or LOD. This list should be tailored to individual contract/program needs and individual CAO capabilities. For example, programs with critical, high-risk software/firmware development would certainly require more extensive monitoring than those with validated off-the-shelf software. The request for proposal package and referenced applicable documents should be reviewed prior to selecting items from the list. Obligation of the contractor to correct deficiencies as a result of CAO monitoring activities will vary depending on contractual requirements.

Any resulting list of items should be negotiated between the program office and the CAO to assure sufficiency of monitoring activities and availability of CAO resources to perform the functions.

a. If provisions of MIL-S-52779A are on contract (applicable paragraph from MIL-S-52779A)

(1) Use MIL-HDBK-334 as guidance to monitor for compliance with MIL-S-52779A requirements. (Para 1.1)

(2) Review SQA Plan and Procedures for compliance with MIL-S-52779A (as tailored, if applicable). (Para 3.1)

(3) Assess the contractor's organization and review position descriptions to assure personnel have authority and responsibility to perform SQA functions.(Para 3.1)

(4) Audit the SQA organization to verify QA audit reports are being written and presented to management. (Para 3.2.6)

(5) Review tools, techniques, and methodologies (TTM) to assure they are being used as intended (described in the SQA Plan and Computer Program Development Plan). Verify TTMs are validated, effective, and accurate. (Para 3.2.1)

(6) Monitor for compliance with procedures on use of tools, techniques and methodologies. Audit records and results of TTM to assure feedback to contractor QA functions. (Paras 3.2.1 and 3.2.6)

(7) Review programming standards and conventions to assure compliance with contractual requirements and internal procedures. Audit coding for compliance with programming standards and conventions. Audit tailoring of these standards and conventions for individual programs to assure flow-down of requirements and authority for changes. (Para 3.2.4.

(8) Audit design documentation for proper reviews, including conduct of internal design reviews, prior to submittal to the Government. Audit for independent internal reviews of design documents. (Para 3.2.4)

(9) Audit for traceability between software requirements and software design documents. (Para 3.2.2)

(10) Monitor for progress on tasks as described by project schedules; key on software development schedule. Report variances as they happen but no less frequently than monthly. (Para 3.2.3)

(11) Review design documents for compliance with Contract Data Requirements List (CDRL) and Data Item Description (DID) format. Assure concurrent development of contract data/documentation with development of software. (Para 6.2.2)

(12) Monitor existence and compliance with configuration control procedures for design documentation. (Para 3.2.7)

(13) Audit design documentation, data dictionary (if available), and source listings to verify that naming conventions (as described in the Computer Program Development Plan (CPDP) and internal procedures) are being followed. (Paras 3.2.2 and 3.2.4)

(14) Assure design requirements as delineated in the Statement of Work (SOW) and A-Spec (usually Paragraph 3.3.8) are being followed e.g., top down, modular, commenting conventions. (Para 1.3)

(15) Monitor the configuration management of patches and assure replacement (incorporation) prior to delivery. Assure the contractor is aware of the ground rules for patches. (Para 3.2.9.d)

(16) Monitor for compliance with program support library procedures (internal and those in CPDP). Assure versions are safeguarded, identified, and accurate. (Para 3.2.5)

(17) Audit for contractor SQA participation in informal and formal reviews and audits. Verify follow up action taken on items resulting from reviews and audits. (Para 3.2.6)

(18) Monitor the contractors compliance with the Configuration Management Plan and CM control procedures for software products. (Para 3.2.7)

(19) Review Configuration Management Audits and determine if corrective action is identified, adequate, and implemented. (Para 3.2.7)

(20) Assure test plans and procedures are internally reviewed prior to submittal to Government. Review for compliance with DID format. Para 3.2.8.b)

(21) Witness/monitor all formal software tests (PQTs, FQTs), integration and systems testing. Sample informal testing to assess progress and compliance with internal procedures. (Para 3.2.8)

(22) Review test reports to certify accuracy of formal test results. (Para 3.2.8.f)

(23) Audit software trouble reports to assure coordination with proper organizations, ranked according to severity, adequately described, and properly resoluted. Review documentation of "fix", if applicable, as well as, results of retesting. Examine extent of retesting to determine adequacy. (Para 3.2.9)

(24) Identify recurring problems and rates of open/closed software trouble reports and identify trends. (Paras 3.2.9.c and 3.2.9.d)

(25) Review contractor retest decisions to verify that all affected code was evaluated/retested. (Para 3.2.9.e)

(26) Audit deliverable code for matching, verified against, the master. (Para 3.2.7)

(27) Monitor the contractor's method for identifying critical software/firmware for subcontractors. (Para 3.3.)

(28) Audit tailoring and flow-down of software/firmware requirements to subcontractors. (Paras 3.3 and 6.2.1.c)

(29) Monitor contractor's system for assuring subcontractor organization/personnel are qualified for performance of SQA functions. (Para 3.3)

(30) Audit the contractor's system for compliance with the SQA Plan. (Para 3.1)

(31) Audit contractor's compliance with internal computer software policies and procedures. (Para 3.1)

(32) Review contractor's selection of support software and computer hardware to assure Govcernment acceptability is established prior to their use. (Para 3.2.8)

b. MIL-STD-1679 Specific Requirements (Paragrapns 5.8-5.10).

(1) Audit software trouble reports to assure they are prioritized by severity as required by Para 5.8.5.2 and categorized properly in accordance with 5.8.5.1.

(2) Audit modules for completion of a code walk through prior to module testing. (5.8.1)

(3) Witness/monitor critical module tests (identify in the MOA/LOD). (5.8.1)

(4) Witness/monitor critical subprogram tests (identify in the MOA/LOD). (5.8.2)

(5) Witness/monitor all program performance tests. (5.8.3)

(6) Witness/monitor all systems integration tests. (5.8.4)

(7) Audit the contractor QA organization for participation in design reviews and design walk-throughs and following up on action items. (5.9.1.3)

(8) Audit testing to assure that the software used is the current approved version. (5.10.2.2)

(9) Audit test program operation (5.10.2.4), duration (5.10.2.5), input data (5.10.6) and stress (5.10.2.7) for compliance.

(10) Audit testing to assure conduct in the proper testing environment (in accordance with Paragraphs 5.10.2.1, 5.10.2.8 and 5.10.2.9).

(11) Audit retesting for conduct in accordance with Paragraphs 5.10.2.10 and 5.10.3.

(12) Audit error (Para 5.10.3.1) and patch limits (Para 5.10.3.2) to assure they are within requirements.

c. Miscellaneous:

(1) Use ESD-TR-82-145 software quality metrics handbook, to provide an assessment of the software for critical CPCIs (PO/CAS must identify).

(2) Use ESD-TR-80-115, Vol I, II to help monitor the sizing and timing analysis reports. Flag borderline and discrepancies in meeting contractual requirements, significant growth since last analysis should be reported. Audit for reserve growth capability.

(3) Audit software development folders (for compliance with CPDP) to assure proper contents and updating of material.

(4) Monitor recording and reporting of work breakdown system cost data and audit the data for accuracy.

(5) Monitor changes (growth) in number of lines of executable code compared to estimates at time of CDR. Ascertain from the contractor the impact of these changes on cost and/or schedule. Report code growth and impact to the buying office.

(6) Audit for compliance with DODI 5000.31, 5000.5X and AF directives on the use of High Order Languages (HOLs) and Instruction Set Architectures (ISAs).

(7) Monitor software and documentation to identify proprietary products used anywhere in the development process. Report items to the buying office which are incorrectly identified as proprietary in accordance with the contract.

(8) Monitor processes used to assure concurrent review/approval of interrelated hardware and software elements of a system.

(9) Monitor the contractor's use of structured programming techniques.

(10) Assess the contractor's readiness for scheduled reviews and audits and provide timely input to the program office.

(11) Assure contractor has identified all support software tools and verified that each tool's data rights designation is in accordance with the contract's data rights clauses.

Figure [illegible]. SPO INSPECTION CHECKLIST - SOFTWARE QUALITY ASSURANCE

DOCTRINE	DIRECTORATE OF ENGINEERING & TEST JANUARY 1982	
[illegible]	AFR 800-14	MIL-S-52779A
[illegible]	AFSCR 74-1	MIL-STD-1679
MIL-HDBK-334	AFR 74-1	MIL-STD-490
		MIL-STD-483

.. Program Office Software Quality Assurance Management

a. Is someone within the program office (PO) designated as being the primary individual responsible for Software Quality Assurance (SQA)?

b. Are SQA responsibilities included in job description for either QA personnel or computer resource personnel?

c. Is SQA covered in any of the PO's operating instructions?

d. Do the individuals responsible for SQA have any background or training in software in general or SQA specifically?

e. Is SQA included in any ongoing training programs for appropriate PO personnel?

.. Pre-contract Software Quality Assurance

a. Has all program management and policy direction been reviewed with respect to SQA?

b. Have any SQA requirements been incorporated into the PMP? Were they developed in coordination with other software related functions of the PO?

c. Was MIL-S-52779A, and/or the quality assurance portions of MIL-STD-1679 invoked for this contract? If so, how were the requirements tailored?

d. Is there a specific procedure to assure SQA requirements have been incorporated into the contract or RFP (specifications, SOW, required reports on CDRL, etc.)?

e. Are there SQA evaluation criteria established for use in source selection?

f. Is anyone specifically responsible for SQA considerations during precontractual activities such as acquisition strategy panels, source selection evaluation, work statement reviews, pre-award surveys, etc?

g. Is firmware treated as software?

h. Are high-order language requirements of DODI 5000.31 and AFR 800-14, Vol. II, AFSC Sup 1, met or have appropriate waivers been obtained?

3. Early Stage-Contract QA Planning/Action

a. Is SQA covered in any Memorandum of Agreement (MOA) or Quality Assurance Letter of Instruction (QALI)?

b. Has the ability of the CAO to monitor SQA activities of the contractor been reviewed? Is required training or hiring being done?

c. Have the contractors plans/procedures been reviewed to assure implementation of SQA requirements?

d. Have SQA requirements been imposed on subcontractors?

e. Has the ability of the contractor to monitor any necessary sub-contractor SQA activities been verified?

4. Contract Performance and Contract Monitoring

a. Have specific SQA considerations been included in the topics to be covered at reviews and audits (SDR, PDR, CDR, FCA, PCA) or have any SQA specific reviews been planned or accomplished?

b. Do SQA personnel participate in formal reviews and audits (SDR, PDR, CDR, FCA, PCA)?

c. Do the CAO and the PO monitor the status of software problem/trouble reports and software-related ECP's?

d. Is there a specific method for monitoring overall effectiveness of the contractor's SQA program/efforts?

e. Are there documented procedures by which PO SQA personnel can review and discuss software deficiencies with the CAO?

f. Are there documented procedures for requiring the contractor to correct software deficiencies?

g. What actions are taken by PO SQA personnel to assure the contractor is pursuing adequate corrective action with respect to software?

h. Are SQA personnel assisting the CRWG and the planned support organization (AFLC or using command) in developing SQA requirements to be met after program management responsibility transfer (PMRT)?

i. Have appropriate SQA requirements been included in the CRISP by the CRWG?

j. Are SQA personnel involved in the QA assessments for major programs that are required by AFR 74-1 and AFSCR 74-1?

k. Is someone in the PO designated as being responsible for reviewing verification/testing cross-reference listings for software to assure the contractor will test all software requirements appropriately?

l. Are SQA personnel involved in reviewing test procedures?

m. Do SQA personnel participate in formal testing (qualification testing, DT&E, IOT&E)?

n. Are SQA personnel involved in reviewing software documentation (specifications, manuals, listings, etc.) for compliance and/or acceptance purposes?

o. Are there provisions for government access to software-related data and information used by the contractor during development?

Figure [illegible]9-3. Software Quality Assurance Plan (SQAP)

Checklist

Definition: The SQAP describes the Software Quality Assurance (SQA) Program organization and procedures of the contractor to assure that software delivered under the contract complies with the requirements of the contract. The SQAP shall be directed toward the design and production of software that is reliable, maintainable, and functional. This SQAP is designed IAW DI-R-3521. The SQAP can be incorporated in the CPDP and is required as a proposal document.

1. Does the SQAP plan identify the organizational element(s) responsible for various software quality efforts to be accomplished?

2. Do the software quality personnel performing the necessary functions have sufficient authority, responsibility, and freedom of action to evaluate software design and product activities, and to initiate and/or recommend changes?

3. Do the duties to be performed by the software quality personnel have specific documented definitions?

4. Does the SQAP reflect all software development information or is it clearly cross-referenced to other contractual documentation? Is such information clearly referenced by title, source, and paragraph number? Is there a cross-reference table which shall clearly indicate the correspondence between this plan's paragraph organization and the requirements of the format in accordance with DI-R-3521 or other approved DID?

5. Is the scope of the SQA plan provided and are all development policies, procedures, and products subject to the provisions of the plan described?

6. Are the objectives of the SQA Plan and the goals of the SQA efforts stated using software development milestones and visible indicators?

7. Is there a list of applicable standards and specifications to be followed?

8. Does the contractor identify the tools, techniques, methodologies, and records that shall be employed in the performance of work which will support SQA objectives and goals, and describe how their use will augment or satisfy the requirements of MIL-S-52779A?

9. Does the plan reference or document the policies, practices, and procedures by which design documentation is reviewed to evaluate design logic, fulfillment of requirements, completeness, and compliance with specific standards?

10. Is it noted that design shall be subjected to independent review prior to its release for coding?

11. Does the plan reference or document the contractor's policies, practices and procedures for normally approving or certifying the description, authorization, and completion of work performed under the contract?

12. Does the plan provide for effective monitoring to assure compliance with these procedures?

13. Does the plan reference or document the contractor's policies, practices, and procedures for the controlling and handling of source code and object code and related data in their various forms and versions, from the time of their initial approval or acceptance until they have been incorporated into the final media? (The objective of these controls is to ensure that different computer program versions are accurately identified and documented, that no unauthorized modifications are made, that all approved modifications are properly incorporated, and that software submitted for testing is the correct version).

14. Does the plan reference the documentation standards and programming conventions and practices to be used for all software referenced or documented in the plan?

15. Does the plan reference a library procedure or are they incorporated within the plan?

16. Does the plan reference or document the contractor's policies, practices, and procedures for preparation and execution of formal and in-house reviews and audits, for establishing the traceability of initial contract requirements through the successive baselines, and for ensuring that the reviews and audits are conducted in accordance with the prescribed policies, practices, and procedures?

17. Is the schedule for reviews and audits referenced, or stated as in attachment to the plan?

18. Does the plan specify the relationships between the SQA and (CM) Configuration Management programs and reference or document the policies, practices, and procedures for assuring that the objectives of the CM program are being attained?

19. Does the plan reference or document policies, practices, and procedures for assuring the accomplishment of the following:

a. Design of software to allow the complete testing of all programs and subprograms.

b. Review of test requirements and criteria for adequacy, feasibility, and traceability and satisfaction of requirements.

c. Review of test plans, policies, practices, procedures, and specifications for compliance with contractor and contractual requirements and to insure that all authorized and only authorized changes are implemented.

d. Verification that tests are conducted in accordance with approved test plans and procedures.

e. Certification that test results are the actual findings of the tests.

f. Review and certification of test reports.

g. Ensuring that test related media and documentation are maintained to allow repeatability of tests.

h. Ensuring that support software and computer hardware to be used to develop and test software and hardware under the contract are acceptable to the Government.

20. Does the plan reference or document policies, practices, and procedures which assure the prompt detection, documentation, and correction of software problems and deficiencies? Do the procedures include:

a. Documenting and reporting problems and deficiencies to appropriate management levels.

b. Analysis of data and examination of problem and deficiency reports to determine their extent and causes.

c. Review of corrective measures to insure that problems and deficiencies have been resolved and correctly reflected in the appropriate documents.

d. Analysis of trends in performance of work to prevent the development of noncompliant products.

e. Analysis or review as otherwise provided for in the contract.

21. Does the plan reference or document the policies, practices, and procedures to assure that all software acquired from subcontractors conform to applicable requirements of the contract?

Figure II-9-4. GUIDANCE FOR APPLYING MIL-S-52779A

The following pages provide guidance for applying and tailoring Mil-S-52779A, Software Quality Assurance Program Requirements, to contracts. The first page presents guidance for choosing which paragraphs of the MIL-S apply to non-deliverable software. The pages following it give a suggested Statement of Work (SOW) paragraph and "applicable documents" tailoring guide for the SOW.

Close examination of the tailoring will also reveal that some requirements of the MIL-S have been expanded to give a more comprehensive SQA program. An example of this is the tailoring of paragraph 3.2.4, Documentation, to require the contractor's SQA to review internal software development documentation, such as programmer notebooks, and all deliverable software-related documentation.

In using this guide, do not forget that it is only a guide and must be applied judiciously to meet the requirements of a given system acquisition while giving the government the maximum cost-effective contractor SQA program.

GUIDANCE FOR APPLYING MIL-S-52779A TO NON-DELIVERABLE SOFTWARE

For the purposes of applying MIL-S-52779A to non-deliverable software, it is necessary to categorize this software into two classifications:

1. Test software. Automated Test System (ATS) and Computer Aided Inspection used to accept or test CPCI/CI, total system, subsystem, or lower, whether used for in-process testing or final acceptance. Suggested minimum applicable paragraphs of MIL-S-52779A are: Sections 1 & 2, Paragraphs 3.1, 3.2, 3.2.1, 3.2.2, 3.2.4, 3.2.5, 3.2.7, 3.2.8, 3.2.9, and 3.3 and Section 4.

2. Other non-deliverable software. This includes such software as support tools (e.g. simulators, emulators, test case generators, code auditors, etc.), computer aided design (CAD) software used to design or support the design of software or equipment (e.g. automated drawings, design analysis tools, modeling tools, digitizers, data base design aids, etc.), computer aided manufacturing (CAM) software and software to control robotics and numerical control processes. Suggested minimum applicable paragraphs of MIL-S-542779A are: Sections 1 & 2 and Paragraphs 3.2, 3.2.1, 3.2.5, 3.2.7, 3.2.9, and 3.3.

This may be represented tabularly as follows:

MIL-S-52779A	Test Software	Other Non-Deliverable Software
Sect 1 & 2	X	X
Para 3.1	X	
Para 3.2	X	X
Para 3.2.1	X	X
Para 3.2.2	X	
Para 3.2.3		
Para 3.2.4	X	
Para 3.2.5	X	X
Para 3.2.6		
Para 3.2.7	X	X
Para 3.2.8	X	
Para 3.2.9	X	X
Para 3.3	X	X
Sect 4	X	

* * * *

c. Review allocation of Computer Program Development Specification requirements to CPC's and verify traceability down to the module level.

d. Review the Verification Cross-Reference Matrix of the Computer Program Development Specification to assure that all requirements are tested and that the verification method is appropriate.

e. Review Preliminary Design Review (PDR) data and attend PDR. Identify deficiencies and follow-up on corrective action to assure appropriateness and implementation of resolution.

X.X.X.2.2.2. Detailed Design Phase.

a. Accomplish the items of paragraph X.X.X.2.2.1 except for subparagraph d and e. Substitute preliminary "Computer Program Product Specification" for "Computer Program Development Specification" and "Critical Design Review" (CDR) for "PDR."

b. Review the test approach and methodology. Verify that test plans are comprehensive by insuring that all specification requirements will be verified. Verify the adequacy of acceptance criteria. Review the Test Plan/Procedure Cross Reference Index of the Computer Program Product Specification for completeness and adequacy.

c. The contractor shall review subsequent releases of design specifications for completeness and traceability (as described above in X.X.X.2.2.1 b and c for computer program specifications).

X.X.X.2.2.3. Coding. Programming standards and conventions shall be documented and available for review by the government personnel. Contractor shall systematically sample and examine coding to ensure compliance with requirements, design and programming standards and conventions. Deficiencies shall be brought to the attention of the appropriate level of management, corrected, and tracked IAW MIL-S-52779A, paragraph 5.2.9.

X.X.X.2.3. Work Certification. Contractor shall monitor the procedures for formally approving or certifying the description, authorization, and completion of work performed under this contract and assure compliance with these procedures.

X.X.X.2.4. Documentation.

Contractor shall assure review of all software-related documentation to assure compliance with all requirements of the contract and applicable in-house standards.

X.X.X.2.4.1 Software Development Documentation. Contractor SQA shall periodically audit software development documentation to assure compliance with applicable in-house standards and procedures. This audit shall include as a minimum: assurance of proper design and test data, necessary [illegible], maintenance of status logs (for history, changes, and problems), [illegible], problem reports, and programmer notebooks, unit development [illegible] documentation that are in use.

X.X.X.2.4. Deliverable Documentation. In addition to the specification review requirements of paragraph X.X.X.2.2, the contractor shall assure review of all deliverable software related documents for compliance with contractual requirements and applicable in-house standards and procedures. Examples of software-related documents are specifications, data-base design documents, interface specifications, positional handbooks, users manuals, operator manuals, and maintenance manuals.

X.X.X.2.5. Computer Program Library Controls. The Contractor shall audit for compliance with the procedures and controls for the Computer Program Library.

X.X.X.2.6 Reviews and Audits. The contractor shall address both internal/informal and formal reviews and audits (to include internal design documentation reviews and design and code walkthroughs) and prepare a schedule participation IAW to paragraph 3.2.6 of MIL-S-52779A.

X.X.X.2.7. Configuration Management (CM). Contractor shall ensure that adequate configuration management techniques and procedures exist to control software configurations. These shall address both the contractor's internal development environment and formal baselines reportable to the Government. The Contractor shall define the responsibilities for controlling various libraries and media (e.g. working library and master media) and other configuration management procedures as applicable to SQA, software development and configuration management personnel. Contractor shall audit for compliance with these techniques and procedures.

X.X.X.2.8. Testing. The contractor shall ensure that support software and hardware used to develop and test software and hardware meets the requirements of the contract and all in-house standards. The support software and hardware shall also be reviewed prior to use of evidence for validation testing under this contract or from previous applications.

X.X.X.2.9. Corrective Action. The Contractor shall assure that documented procedures exist and are properly complied with which assure prompt detection, documentation and correction/disposition of software problems and deficiencies.

X.X.X.3 Applicable Documents

Number and Date	Title	Application
MIL-S-52779A 1 Aug 79	Software Quality Assurance Program Requirements	All, para 1.1. tailored is by the following

Paragraph 1.1. Add the following: All software that is modified under this contract will be treated as software in respect to the SQA program.

DATA ITEM DESCRIPTION	2. IDENTIFICATION NO(S)	
	AGENCY	NUMBER
1. TITLE Software Quality Assurance Plan	USAF	DI-R-3521

3. DESCRIPTION/PURPOSE

3.1 This Data Item Description (DID) defines the requirement for a Software Quality Assurance (SQA) plan.

4. APPROVAL DATE

1982 September 21

5. OFFICE OF PRIMARY RESPONSIBILITY

HQ MAC/AD

6. DDC REQUIRED

8. APPROVAL LIMITATION

7. APPLICATION/INTERRELATIONSHIP

7.1 This DID may be applied to the acquisition of deliverable software and firmware, either alone or as a portion of a system or subsystem, and to non-deliverable design, test, support, and operational software developed under contract.

7.2 This DID satisfies the requirements of Paragraphs 3.2 and 3.3 of MIL-S-52779A, Software Quality Assurance Program Requirements

9. REFERENCES (Mandatory unlisted in block 10)

*MIL-S-52779A

MCSL NUMBER(S)

OMB Exempt
*AMSC No. A3084

10. PREPARATION INSTRUCTIONS

10.1 The SQA Plan shall include sections that specifically address each of the following paragraphs of MIL-S-52779A:

a. 3.2 Software QA Program Requirements
b. 3.2.1 Tools, Techniques, and Methodologies
c. 3.2.2 Computer Program Design
d. 3.2.3 Work Certification
e. 3.2.4 Documentation
f. 3.2.5 Computer Program Library Controls (CM)
g. 3.2.6 Reviews and Audits
h. 3.2.7 Configuration Management
i. 3.2.8 Testing
j. 3.2.9 Corrective Action
k. 3.3 Subcontractor Control

10.2 The plan may be prepared in the vendor's format, subject to the following constraints:

10.2.1 It shall be typewritten or clearly lettered and copies shall be reproduced with non-fading ink on white 8½" x 11" paper.

10.2.2 The title, date, and contract number shall be on a title page. Other relevant information may be included.

10.2.3 Attachments shall be prepared on standard letter size paper or standard size engineering drawing paper. Each attachment shall be fully identified and shall be referenced in the text of the plan.

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Section 10. Computer Program Development Capability/Capacity Review (Pre-Award Survey)

10-1. Review the AFSC Sup to AFR 800-14, Vol I.

10-2. Review AFSCR 70-7.

10-3. Review any corporate software documents available, i.e., Software Quality Plans, Computer Development Plans/Procedures.

10-4. Review Figure II-10-1, Computer Program Development Capability/Capacity Review Questions.

NOTE: The Manufacturing Directorate within ESD/AL has primary responsibility for overseeing pre-award surveys and manufacturing management production capability reviews. Both areas revolve around evaluation of offeror's in the source selection time frame. Any pre-award survey effort should be coordinated with this organization.

AD-A142 715 HANDBOOK FOR EVALUATION AND LIFE CYCLE PLANNING FOR SOFTWARE VOLUME 2 CONTRACT MANAGEMENT(U) ELECTRONIC SYSTEMS DIV HANSCOM AFB MA M FORSHEE ET AL. 01 FEB 83 2/2

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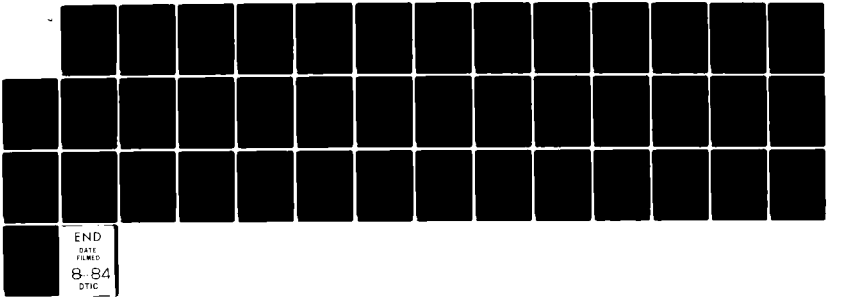

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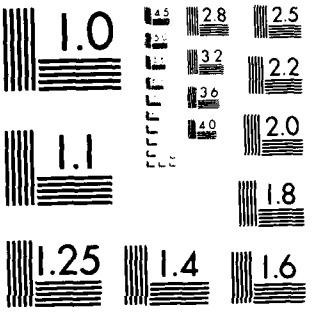

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NATIONAL BUREAU OF STANDARDS 1963-A

f. Interface

1. How does software engineering interface with systems engineering?

2. How does functional and subsystem engineering interface/participate in software engineering?

3. How does software development interface with configuration management, data management, test and quality assurance?

g. Reporting

1. How is status reporting correlated among cost performance reporting, technical documentation and program management status reporting?

2. Who is responsible to make sure all software reporting is consistent across disciplines and subsystems?

3. Who is responsible to determine and report software status?

h. Staffing

1. How does the lead software manager determine and acquire the personnel resources needed?

2. How does the lead software manager acquire additional resources?

3. How is the software manager assured of retaining the personnel resources and expertise for the duration of the project?

4. How long are the key software developers committed to the program team? How often is this reviewed?

5. Are there any significant changes in your software development staffing for PDR, CDR or during the test phases?

6. What is your criteria for bringing on job shopper software specialists?

3. AVAILABILITY OF SOFTWARE PERSONNEL

a. Requirements

1. How do you determine the number of software personnel required to initiate a program?

2. What is the basis for the sizing of the manpower requirement?

b. Availability Criteria

1. What is your criteria for determining availability, i.e., bidding the key software personnel?

2. What leverage do you have to pull key people off other programs?

c. Manning Control and Decisions

1. Who participates in the personnel availability deliberation for the program, and who ultimately decides?

2. Are personnel resources controlled out of a "home office", i.e., in a matrixed organization? If so, how will that affect the assignment of personnel to this project, and the control of personnel assigned?

d. Incentives

1. What incentives are offered to key software developers to motivate performance?

e. Location

1. Do you plan to develop all of the subject program software at one geographical location? If not, describe the development structure you intend to use. Where does the overall software development responsibility reside?

4. COMPANY WORKLOAD PROFILE

a. On-going and Planned Contracts

1. Identify all on-going and planned contracts which include software development.

2. Identify the magnitude of the composite company software efforts under development, and planned efforts.

3. Identify schedules and status of the software development on these programs.

b. Software Personnel Profile

1. Identify a composite company profile of software personnel working on all on-going and planned contracts.

2. Categorize these personnel by skills and experience and years of experience, including years with the company.

3. How do you track and manage personnel turn-over?

4. How important is software personnel stability to your program stability and success? What is the basis for your assessment of stability needs?

5. Is software personnel stability dependent on the application subsystem involved?

c. Subcontractor/Job Shoppers

1. How many subcontractor software personnel are employed on your company contracts (workload profile)?

Figure II-10-1. Computer Program Development Capability Capacity Review List of Factors

NOTE: These factors were developed by ASD/EN under the direction of Mr. Phil Babel. Various draft iterations were commented on by many organizations, including the ESD technical staff.

1. Management Organization
2. Personnel Qualifications
3. Availability of Software Personnel
4. Company Workload Profile
5. Software Subcontracting
6. "Make or Buy" Criteria
7. Computer Program System Organization and Structure
8. Support Software Development Facilities
9. Software Development Tools
10. Software Management System
11. Software Cost Reporting
12. Test and Verification
13. Software Configuration Management
14. Internal Development Standards
15. Software Contract Work Breakdown Structure (CWBS)
16. Software Work Definition
17. Contract Control Methods
18. Software Documentation Approach
19. Software Product and Quality Assurance
20. Software Estimating, Size, Schedule Cost
21. IV&V Interfaces

1. MANAGEMENT ORGANIZATION

a. Structure

1. How is the software development activity structured within the program development organization?

2. How is this structure maintained throughout the program?

3. Where does the overall software responsibility reside? Is there a single lead software manager or are there several lead software managers for the program?

4. What are the minimum qualifications for the lead software engineering manager?

5. How are the lead software manager and the lead software engineering roles and responsibilities managed?

6. How is the total software development team organized, top to bottom, including intermediate organizational and supervisory levels?

b. Level

1. At what level does software development interface with program management?

2. What is the organizational level of the lead person responsible for software development?

3. At what levels are the software functions of program management assigned, e.g., schedule compliance and status assessment tracking?

c. Control

1. What personnel resources are controlled by the lead software manager?

2. Who writes and controls the lead software manager's performance rating?

3. Who must agree and coordinate on software personnel requests?

d. Completeness

1. What functions are performed by the software development team, e.g., analysis through test?

2. Which software, by catagory, is developed by the software development team?

3. Where is support software developed?

4. What percentage of the software development team is dedicated full time?

e. Interface

1. How does software engineering interface with systems engineering?

2. How does functional and subsystem engineering interface/participate in software engineering?

3. How does software development interface with configuration management, data management, test and quality assurance?

f. Reporting

1. How is status reporting correlated among cost performance reporting, technical documentation and program management status reporting?

2. Who is responsible to make sure all software reporting is consistent across dicipline and subsystems?

3. Who is responsible to determine and report software status?

g. Staffing

1. Are there software personnel matrixes?

2. How does the lead software manager determine and acquire the personnel resources needed?

3. How does the lead software manager acquire additional resources?

4. How is the software manager assured of retaining the personnel resources and expertise for the duration of the project?

5. How long are the key software developers committed to the program team? How often is this reviewed?

6. Are there any significant changes in your software development staffing for PDR, CDR or during the test phases?

7. What is your criteria for bringing on job shopper software specialists?

2. PERSONNEL QUALIFICATIONS

a. Experience

1. What is your corporate software development capability per your key personnel experience and qualifications?

2. Identify the average years of software development experience among your staff.

3. What is the percentage of this experience acquired while with your company?

4. What personnel turn-over rate are you experiencing in software?

b. Academic Qualifications

1. How many of your software development personnel have scientific engineering, math, or Computer Science degrees? How many of these personnel will be assigned to the subject program?

2. Of the proposed software staff, how many have an advanced computer science degree?

3. How do you determine the level of academic background required to assure sufficient technical capability?

4. What are your academic requirements/standards for software developers?

c. Related Program Experience

1. What is the relevance of the program experience of your staff to the subject program?

2. Does your experience include real-time weapon system software? How does that experience relate to the needs of this program?

3. (This factor should be pursued as a function of the subject program, e.g., in electronic warfare, experience in designing for reprogrammability.)

d. Classification by Skills

1. How do you classify and distinguish software technical skills, e.g., analyst, engineers, programmers?

2. How do you classify and identify software development management skills?

e. Training

1. What type of training program have you established for technical and management skills of software development?

2. Do you have required in-house training programs for software practitioners?

3. How is this training administered, e.g., is there a required curriculum or set of courses?

4. What incentives exist for your people to pursue the software training?

f. Interface

1. How does software engineering interface with systems engineering?

2. How does functional and subsystem engineering interface/participate in software engineering?

3. How does software development interface with configuration management, data management, test and quality assurance?

g. Reporting

1. How is status reporting correlated among cost performance reporting, technical documentation and program management status reporting?

2. Who is responsible to make sure all software reporting is consistent across disciplines and subsystems?

3. Who is responsible to determine and report software status?

h. Staffing

1. How does the lead software manager determine and acquire the personnel resources needed?

2. How does the lead software manager acquire additional resources?

3. How is the software manager assured of retaining the personnel resources and expertise for the duration of the project?

4. How long are the key software developers committed to the program team? How often is this reviewed?

5. Are there any significant changes in your software development staffing for PDR, CDR or during the test phases?

6. What is your criteria for bringing on job shopper software specialists?

3. AVAILABILITY OF SOFTWARE PERSONNEL

a. Requirements

1. How do you determine the number of software personnel required to initiate a program?

2. What is the basis for the sizing of the manpower requirement?

b. Availability Criteria

1. What is your criteria for determining availability, i.e., bidding the key software personnel?

2. What leverage do you have to pull key people off other programs?

c. Manning Control and Decisions

1. Who participates in the personnel availability deliberation for the program, and who ultimately decides?

2. Are personnel resources controlled out of a "home office", i.e., in a matrixed organization? If so, how will that affect the assignment of personnel to this project, and the control of personnel assigned?

d. Incentives

1. What incentives are offered to key software developers to motivate performance?

e. Location

1. Do you plan to develop all of the subject program software at one geographical location? If not, describe the development structure you intend to use. Where does the overall software development responsibility reside?

4. COMPANY WORKLOAD PROFILE

a. On-going and Planned Contracts

1. Identify all on-going and planned contracts which include software development.

2. Identify the magnitude of the composite company software efforts under development, and planned efforts.

3. Identify schedules and status of the software development on these programs.

b. Software Personnel Profile

1. Identify a composite company profile of software personnel working on all on-going and planned contracts.

2. Categorize these personnel by skills and experience and years of experience, including years with the company.

3. How do you track and manage personnel turn-over?

4. How important is software personnel stability to your program stability and success? What is the basis for your assessment of stability needs?

5. Is software personnel stability dependent on the application subsystem involved?

c. Subcontractor/Job Shoppers

1. How many subcontractor software personnel are employed on your company contracts (workload profile)?

2. How many job shoppers are employed on your programs?

d. Financial Profile

1. What is your balance sheet status - assets/liabilities/net worth?

2. Do you have a copy of your last external audit report?

3. What is the cost structure of your software business component by:

direct salaries
fringe benefits
pensions
other overhead
overhead rate

4. What have been your software contract profiles (sales) over the last five years?

5. Identify the contract dollars by type of software development, i.e., business, command and control, real-time, etc.

5. SOFTWARE SUBCONTRACTING

a. Management

1. How do you set up to manage subcontractors developing software?

2. Who in your company is responsible for their contractual software performance?

3. How does the program director manage/control this software?

4. Do you apply your software development standards and tools to your subcontractors? If not, what are your requirements to assure the subcontractor adheres to standards?

5. How do you assess (survey) a subcontractor's software development capabilities prior to selecting a specific subcontractor?

b. Reporting

1. What reporting do you require of your subcontractor relative to software? How is this reporting tied to the subcontractor WBS? To what level do you require the subcontractor's software to be identified and reported in his WBS?

2. Provide samples of specific reports from on-going subcontracts.

3. Specifically how do you assess a subcontractors software (SW) status? What do you base your assessment on?

4. Do you require a detailed report?

c. Interfaces

1. How is the subcontractor's software interfaced with your internal software and that of other subcontractors?

2. How do you interface the various subcontractors software technical requirements?

3. What approach do you follow to allocate computer program development requirements to subcontractors?

d. Contractual

1. Ho do you establish your contract terms, internal standards?

2. What are your rights to software clauses and criteria? Is it possible a subcontractor will deliver software bearing a proprietary data legend? If so, how do you propose to satisfy the Government's rights to data requirement?

3. Have you established contractual milestones?

4. Do you provide software development award fees or contractual incentives?

5. Do you set up contractual terms to include progress payments based on software as a line item milestone deliverable?

e. Documentation

1. Identify the set of software documentation you require of subcontractors.

2. How do you review and approve this documentation?

3. What is your approach to documentation as criteria for milestones?

f. Test

1. What are your test criteria and procedures for accepting subcontracted software?

6. "MAKE OR BUY" CRITERIA

a. Criteria/Determination Approach

1. What factors are considered in determining whether or not to subcontract for software or subsystem development?

b. Current and Planned Projections

1. Do you plan to use software subcontractors on the subject contract? If so, identify the subsystem/subsystems functions to be subcontracted.

2. When do you plan to bring on the software subcontractors?

c. Policies

1. What are your make or buy policies for software development?

2. What are your policies for hiring job shopper specialists?

7. COMPUTER PROGRAM SYSTEM ORGANIZATION AND STRUCTURE

a. Organization (CPCI-Component)

1. How is your software organized, i.e, from top of the computer program system (CPS) to bottom, i.e., individual components or modules?

2. Do you use a tree structure to identify and define this CPS organization? If not, describe your approach to identifying (documenting) the top-down CPS organizational structure.

3. Is this CPS organization implemented via computer program to facilitate update and configuration control? Describe your method to configuration manage the CPS structure.

b. Identification

1. How do you assure that each element of the CPS is uniquely identified by name and number?

2. How do you assure that each element of the CPS is identified consistently across all disciplines, i.e., technical, management, contracts, cost, etc.?

c. Completeness

1. How do you assure that all operational and support functions are allocated and accounted for in the CPS organization?

2. How do you manage and integrate existing software with the total CPS to insure a complete system is developed?

d. Responsibilities

1. Is one individual designated as responsible for all software including support, simulation, and test software? If not, how is the responsibility delegated?

2. If outside organizations are developing support or other ancillary software, who are they responsible to on the program? How are these efforts managed?

e. Interfaces

1. How is the software system interfaced with the firmware or hardware elements of the subsystems and system?

2. How is the CPS organized and structured to include major subcontractor developed software?

6. SUPPORT SOFTWARE DEVELOPMENT FACILITIES

a. Computer Systems

1. What is your computer system hardware approach to software development, i.e., identify your host computer system?

2. Identify the computer hardware required to support software development on the subject program.

3. Do you have the host and target computers available to support the subject program?

4. What is your plan to acquire these computers?

5. Are you planning to use any Government Furnished Equipment (GFE) computer equipment on the subject program? If so, identify these requirements.

6. How do you determine the number of input terminals required relative to your peak programming need? What is the expected turn-around? What is your approach to acquiring additional equipment if necessary?

b. Support Software

1. Identify the support software tools you have which you plan to use on the subject program.

2. Identify additional tools required.

3. Identify sources for these tools.

4. Are you planning to use any Government Furnished Property (GFP)/software tools? If so, identify these tools.

c. Simulation Facilities

1. Do you intend to use any simulation facilities in your software development process?

2. Do these facilities exist or do you plan to develop them?

3. Identify your approach to developing or acquiring these facilities including software.

d. Test and Integration Facilities

1. Identify facilities you require to perform the software integration and other systems integration.

2. Do these facilities exist, if so, identify and describe the facilities. Will these facilities be dedicated to the subject program?

3. If the facilities do no exist, how do you intend to acquire the required facilities?

4. Do you intend to use any remote computer resources and facilities? How do you plan to assure sufficient availability of these resources?

e. Deliverable Support Systems

1. Are the support software and computer systems available for delivery to the Air Force for follow-on software support?

2. Are any of these resources proprietary?

3. Are your subcontractors support software development resources available for delivery to the Air Force?

4. How do you handle licensing arrangements?

9. SOFTWARE DEVELOPMENT TOOLS

a. Compiler/Assemblers/Linkers/Editors

1. Identify all software development tools you intend to use on the subject program.

2. Do all these tools exist? Have these tools been validated? Do you have them integrated into your software development environment?

3. If the tools do not exist, what tools are needed and what is your plan to acquire or develop the tools? Do you have a back-up contingency plan?

b. Simulations

1. Identify any simulation tools you intend to use as part of your software development process.

2. Do you intend to write any simulation software?

3. If you do, identify the functions and use of this software.

c. Analysis

1. What is your approach to system and software requirements analysis?

2. Do you intend to use any analysis tools?

3. If you do, identify these tools.

d. Configuration Management

1. What is your approach to software configuration management (CM)?

2. Is any of the configuration management process automated?

3. Do you have configuration management (CM) software tools, e.g., CPS organization tree?

4. Identify the functions of your CM software tools and provide examples of the products.

e. Other Tools

1. Do you have software (SW) tools to support SW cost performance reporting, status reporting, SW Contract Work Breakdown Structure (CWBS), SW work packages/work definition, SW schedules, or SW documentation?

2. Identify these tools and provide examples of the products they generate.

3. Identify any other software development tools you intend to use.

f. Standards

1. Identify company standards which define software development tools, and use of these tools.

g. Computer/Compiler Standards

1. Do you intend to develop the subject program software using acquisition agency designated standards, e.g., JOVIAL J733 and MIL-STD-1750A?

2. Do you have a complete set of tools and expertise/capability to use the tools?

10. SOFTWARE MANAGEMENT SYSTEM

a. Computer Program Development Plan (CPDP)

1. Describe your use of the CPDP.

2. Within your corporate and program structure, which organization writes the CPDP?

3. What information is contained in the CPDP?

4. Provide examples of your CPDP.

5. Who must coordinate on the CPDP?

6. How often is the CPDP updated?

7. How are SW, CM, test, and QA planning handled in the CPDP?

8. How does the CPDP interface with and integrate:

(a) Milestones

(b) Detail Schedules

(c) Work Definition Packages

(d) SW Cost Performance Reporting

(e) CPS Tree (Organization)

b. Control Structure and Report

1. Describe your approach to software management.

2. How is software controlled? Do you have control tools?

3. What is your methodology (procedural approach) to track software status?

4. Do you use a control room approach?

c. Internal Description - Standard

1. Is your software management system described in an internal standard or document? Provide a copy of this document.

2. What software management system was used on your three most recent software development programs? Provide examples of the management tools applied, and products developed on these programs.

d. Schedule - Tiers

1. Describe your approach to organizing and documenting (laying out) software development schedules top to bottom.

2. How many tiers or levels of schedule are employed?

3. Which level is used to status (track) the software progress and report status to the acquisition agency?

4. How do you measure software status relative to schedule tracking?

e. Internal Reviews

1. Define your approach to internal software reviews.

2. Do you use a milestone approach?

3. What is the basis for the review?

4. What follow-on actions are required to correct deficiencies discovered during the review?

5. Do you use walk-throughs?

6. Who are required to participate in the reviews?

7. What specific criteria are used to determine that the reviews are successfully completed?

f. Interface

1. How does software management interface and integrate other internal disciplines such as engineering, configuration and data management, cost performance reporting, test, and QA?

2. How does software management interface with subcontractors developing software?

3. How is software management integrated with systems management, hardware management, and firmware management?

g. Development Tasks

1. Define the software development tasks from start to finish, as identified and actually used within your company.

2. Are these defined in a company standard?

3. How are test, QA, documentation, and CM integrated into these tasks?

h. System - Subsystem - Component Approach

1. Do you manage/develop software within subsystems or across subsystems?

2. How are your CWBS and Work Definition Packages structured?

i. Trouble Reporting

1. Describe your approach to software trouble/problems reporting.

2. Provide your standard reporting forms.

3. How are these reports tracked to assure: corrections of deficiencies, solutions to problems, and completion of the effort?

4. What level within your management organization reviews these reports?

5. What methods do you use for trend analysis reporting of software trouble/problem reports?

11. SOFTWARE COST REPORTING

a. Baseline

1. What is the baseline information from which your software cost reporting is developed?

2. Provide this baseline description and examples of its application.

b. Definition - Tasks

1. Identify the tasks which are included in the software cost reporting.

2. How is the documentation effort costed?

c. Software Types

1. Identify the types or categories of software included in the cost reporting, e.g., operational, development tools, support software, test and integration software. Describe your approach to assure that ALL software which must be developed is costed in the proposal.

d. Reporting Vehicle

1. Describe the process of developing the software cost report information.

2. Specifically identify which tasks are included, e.g., is software QA included or reported separately?

3. What is your criteria for reporting a cost or schedule variance in software development?

e. Common Identification and Correlation

1. How do you control the identification (naming) of the elements of a total software system to assure that the software cost reporting is traceable and can be correlated with the technical products, schedule status, CWBS, and CM identification of the same software system?

12. TEST AND VERIFICATION

a. Plans

1. What is your approach to planning for the test and verification of software?

2. Is this a company standard?

3. Who writes the software test plan?

4. How is this integrated with the system test plan?

5. What is your readiness criteria for start of software test?

6. What is your baseline for start of software test?

b. Levels

1. How many levels of testing is the software subjected to from module verification through system test?

2. Are these test levels formalized?

3. Which levels require test procedures?

c. Requirements and Procedures

1. What is your method to determine that the software requirements are testable?

2. What is your approach to defining software test requirements are testable?

3. Who writes and approves the test requirements and procedures?

4. When are these requirements and procedures prepared?

5. How are the test procedures verified prior to starting formal tests?

d. Tools and Facilities

1. Describe the tools and facilities required to support the levels of software testing defined in "b" above.

2. Do these tools and facilities exist to support the subject program?

13. SOFTWARE CONFIGURATION MANAGEMENT

a. Organizational Approach

1. Who is responsible for software Configuration Management (CM)?

2. How is software CM integrated with engineering and program management?

b. Baselines

1. What configuration baselines are identified for software?

2. When are these baselines established?

3. How are the baselines controlled?

4. How are the software allocations structured, functional and product baselines established, documented, and controlled?

c. CM Identification, Accounting and Control

1. How is software identified, and controlled for accountability?

2. Is the software identification consistent across all disciplines?

d. Organizational Interfaces

1. How does the CM function interface with other organizational elements participating in the software development?

14. INTERNAL DEVELOPMENT STANDARDS

a. Management/Development Status Control

1. Provide your standards for software management/development status control.

2. Provide examples of recent application of these standards.

b. Documentation

1. Provide your standards for software documentation content.

2. Provide your standards for interface documentation.

3. How do you assure that these standards are followed?

c. Quality Assurance

1. Describe your standards for software quality assurance (SQA).

2. Provide examples, e.g., a recent SQA Plan.

3. (Talk to the QA department and determine the specific standards and procedures followed to implement software QA.)

d. Work Definition Packages

1. Provide examples of your standards for software work definition.

2. Provide software work definition packages.

e. Sizing Software Workload

1. Provide your standards for estimating software workload.

2. Provide examples of estimates.

f. Test and Verification

1. Provide your standards for software test and verification plans, requirements, and procedures.

2. Provide examples of test plans, procedures and reports.

g. Application and Enforcement

1. How consistently are these standards applied?

2. Who verifies that the standards are followed?

3. Who has authority to grant a waiver?

15. SOFTWARE CONTRACT WORK BREAKDOWN STRUCTURE (CWBS)

a. CWBS Approach

1. How is software structured in the CWBS?

2. How is it correlated with the technical and status reporting?

3. Provide your internal standards for identifying software work within the CWBS.

b. Level of Software

1. At what level is software structured in the CWBS?

2. What are the factors and criteria for determining the various software levels?

3. At what level (of CWBS) is software reported in the cost performance report?

4. Do you require a detailed WBS from your subcontractors? To what level do you require software in his WBS?

c. Interfaces

1. How does the software CWBS integrate and incorporate all of the disciplines involved in the management and development of software?

2. How do you manage the subcontractor relative to his software CWBS?

d. Application

1. Is software identified consistently within your CWBS?

2. Provide examples of your most recent CWBSs which include software.

16. SOFTWARE WORK DEFINITION

a. Definition and Vehicle

1. How is the software work defined at the lowest level?

2. What vehicle (work package description) is used to define the software work?

3. Is this vehicle a standard within the company?

4. Is the work definition directly traceable to the CWBS?

b. Management Use

1. How do you manage the software work definition, i.e., prepare, review, status, update, and accountability?

2. How is the SW work definition used in status tracking of software development?

3. Is the work definition used to identify work progress? How is this accomplished?

c. Cost Performance Reporting

1. How is the software work definition used in cost performance reporting (CPR)?

2. Explain how CPR data such as earned value is derived?

d. Application Examples

1. Provide a set of software work definition descriptions from a recently completed or on-going program.

2. Provide a written description of the rules and interpretation of the software work definition.

e. Standards

1. Is the software work definition defined by an internal standard?

2. Provide a copy of the standard.

f. Interfaces

1. How does the work definition interface and correlate with the software organization tree, the CM system, the software development organization (staff), and the software management systems?

17. *CONTRACT/CONTROL METHODS*

a. Are there any contractual vehicles terms and conditions which you feel are particularly effective for, or detrimental to, successful software development?

b. Rights to Software

1. Do you intend to use any proprietary software on the subject program? Is this software complete? What language is it written in? How is it documented? How is it structured? How do you intend to demonstrate that the existing software you have is one and the same software which implements the support or performance requirements in the final delivered system?

2. What are the restrictions to the Air Force use of this software?

c. Subcontract Vehicles

1. What contractual terms do you plan to use in acquiring software from subcontractors?

2. How will you assure necessary rights to the software?

3. Do you plan to use incentives or other contractual vehicles to motivate and reward software performance?

d. Incentives - Award Fees

1. What experience do you have with incentives and award fees for software development?

2. Provide actual incentive clauses which you have used successfully.

3. Provide evidence of positive incentives contributing to successful software development.

18. SOFTWARE DOCUMENTATION APPROACH

a. Internal Documentation Approach

1. Describe your approach and requirements for software documentation.

2. Do you use a milestone approach?

3. Is your approach compatible with MIL-STDs-483, 490, and 1521A?

4. How does your software documentation interface with system, subsystem, hardware, and firmware documentation?

5. Which organizations are involved in generating, reviewing, and delivering software documentation to the acquisition agency?

b. Milestone Review and Approvals

1. What role does documentation play in your internal reviews to ascertain software development status and progress?

2. What is the review and approval cycle for software development documentation?

c. Standards

1. Are your software documentation requirements defined in an internal standard?

2. Provide the standards which define your software development documentation requirements.

d. Application Examples

1. Provide examples of your software, documentation including CPDP, Part I CPCI development specifications, test plans, procedures and reports, Part II CPCI product specifications, Interface Control Documents, and other key software documents.

e. Test Plans, Requirements, Procedures, Reports

1. Define your approach, requirements, and standards for software test plans, requirements, procedures, and reports.

f. Specifications

1. What is the role of your software personnel in developing the system, subsystem, and prime item development specifications?

2. How do you allocate functional requirements to a software specification?

3. Who writes the CPCI Performance Specifications?

4. How do you assure that the Section 3 performance requirements are verifiable?

g. Subcontractor Documentation

1. What are your internal standards for software documentation requirements on subcontractors?

2. How do you manage the subcontractors software documentation activities?

3. What incentives do you use to assure the subcontractor is developing "quality" software documentation?

19. SOFTWARE PRODUCT AND QUALITY ASSURANCE

a. Internal Approach

1. What provisions do you apply to assure quality software is developed?

2. Ho do you implement the requirements of MIL-S-52779A?

3. Do you believe the program required by MIL-S-52779A contributes to your objectives in software development?

4. Provide examples and results of your internal software quality initiatives.

b. Quality Assurance Responsibilities

1. What are the responsibilities and mission of the quality assurance organization regarding software?

2. Who is responsible for assuring quality software? What is the role of the software manager in assuring quality software?

c. Organizational Approach

1. How is your software QA function organized?

2. Who does software QA report to?

3. Is the QA chain of command independent of the corporate program manager?

d. Application Examples

1. Provide examples of your software quality assurance plans.

2. Provide a copy of your documented internal standards defining procedures to implement software quality assurance.

20. SOFTWARE SIZE, MANPOWER, SCHEDULE AND COST ESTIMATING

a. Software Size Estimate

1. How do you estimate software size?

2. Do you use any models to estimate software size? Provide a basic description of the software cost estimating model used to support your proposal and development process.

b. Software Manpower Estimate

1. Describe your approach to estimating software development effort based on the size of the software to be developed.

2. Is this approach documented? Provide a copy of this document.

3. Identify the tasks included in your estimate and those not included.

4. Do you use a standard productivity factor?

5. Is your estimation technique based on a published model?

6. What is your level of confidence and basis for confidence in your estimate?

7. Describe your model or estimating method to decide how to distribute the total software development manpower overtime.

c. Schedule Estimate

1. How do you estimate and establish your software development schedule and milestones along the schedule?

2. Is this schedule estimate based on a published model?

3. What is your level of confidence and basis for confidence in your estimate?

d. Software Types

1. Identify your estimation baselines for each major category of software to be developed, e.g., operational, support, development tools test and simulation.

e. Correlation Among Size, Workload, Schedule and Cost

1. How do you correlate software estimtes of size (units, e.g., lines of code) workload (manpower), schedule (duration, with milestones), and cost?

2. Is this correlation traceable in your management planning as defined in the CPDP?

3. Who reviews the estimates and plan for realism and consistency?

21. INDEPENDENT VERIFICATION AND VALIDATION (IV&V) INTERFACES

1. Do you implement internal "independent" verification and validation on your own software development activities and products and/or on your subcontractors software development?

2. Have you interfaced with any procurement agency IV&V contractor on previous programs?

3. Based on that experience, do you think IV&V contributed to a higher quality software product?

4. How would you interface with a software IV&V contractor?

5. Identify the documentation you will have available to support an IV&V effort.

6. What special prime contract contractual clauses are required or expected to support an IV&V contract?

Section 11. Language Waivers

1. Review AFR 800-14, Vol I, AFSC Sup 1
   AFSC/AFLCR 800-46 (ATLAS)

2. Review Figure II-11-1 on guidance policies

3. Waiver is Figure II-11-2.

4. Instructions are Figure II-11-3.

Figure II-11-1 Waiver Guidance

1. The need for a waiver should be identified during the source selection process, not after contract award.

2. If the need for a waiver is identified, the local language focal point should be contacted for assistance. For Jovial, Fortran, Cobol, and Ada, ESD/ALEE is the language focal point. For ATLAS, ALEQ is the focal point.

3. Language waivers are granted only when compelling justification can be shown. Justification must be based on technical, system life-cycle schedule, cost, and/or risk factors.

4. The following factors must be examined in writing the waiver:

   a. Estimate direct development, test, and validation costs of compiler and/or support tools if the waiver is not granted for your application.

   b. Provide compiler and support tool delivery schedules and an evaluation of the impact on system schedules if your waiver is not granted.

   c. Discuss commonality of your planned language with languages used to implement existing and planned system software within the system.

   d. Discuss commonality of your planned language with existing and new support software on other systems that interface with the system.

   e. Describe support concepts and relative support costs over the system life cycle for each of the languages being compared.

   f. Identify technical deficiencies of the languages being compared that affect the language decision.

   g. Identify changes required to the existing AF approved HOL definitions to meet system requirements.

   h Estimate direct and indirect contractor costs associated with each possible language application (for example, training or subcontractor cost).

   i. Identify programming languages and support tools used to develop and maintain support software.

   j. Discuss relative risk assessment, with respect to the system schedule, of using a newly developed compiler compared to using a vendor-supplied seasoned compiler or language.

Figure II-11-2. HIGH ORDER LANGUAGE WAIVER REQUEST

Date_____

PROJECT TITLE:_____

ORGANIZATION PROCURING THE SYSTEM:_____

ORGANIZATION WHICH WILL OPERATE AND MAINTAIN THE SYSTEM:_____

1. DESCRIPTION OF THE PROPOSED HARDWARE CONFIGURATION:

a. Host/Target/Control computer, type, model, etc. _____

_____

b. Memory type:_____Memory size:_____

c. On-line System Peripherals:_____

_____

_____

d. Known available language processors from manufacturer or other sources (e.g., FORTHAN, COBOL, etc.):

1. Assembler
2. Fortran 77 (ANSI 3.9 1978)?
3. Cobol (ANSI 3.23)?
4. Jovial J73?
5. 716 ATLAS?
6. _____
7. _____
8. _____
9. _____

e. Attach an ATS block diagram and a brief engineering description of the ATS application on a seperate sheet. (Applicable for ATLAS)

2. PROPOSED LANGUAGE: _____

a. Is there a standard for this language? (ANSI, IEEE, DOD)_____

b. Is there an existing compiler/interpretor for this language_____

1. When developed?_____

2. For which system(s)?_____

3. Who maintains it?_____

4. Identify required modifications (if necessary)_____

c. Identify support software modifications (if required)_____

_____

_____

d. List of other known USAF Systems which use the proposed language:

1._____

2._____

3._____

4._____

e. List other USAF Systems that interface with this weapon system of the same and other maintenance levels, and the languages used for their software.

	SYSTEM	LANGUAGE
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

3. TECHNICAL EVALUATION:

a. List the appropriate approved HOL language problems and show how such problems are solved with the proposed language. Use actual program examples. (use separate page if necessary.)

b. Can modifications to the approved HOL, use of external procedures, or the extensibility of the language result in the same solution? Explain why not.

4. LIFE CYCLE COST COMPARISON: (use 15 years as the system life). Attach supporting documentation. (Each proposed HOL must be compared on a seperate sheet.)

ITEM	COSTS USING		COMMENTS
	PROPOSED HOL	APPROVED HOL	
COMPILER			
DEVELOPMENT	_____	_____	
MODIFICATION	_____	_____	
MAINTENANCE	_____	_____	
SUPPORT SOFTWARE			
DEVELOPMENT	_____	_____	
MODIFICATION	_____	_____	
MAINTENANCE	_____	_____	
*SYSTEM SOFTWARE			
DEVELOPMENT	_____	_____	
MAINTENANCE	_____	_____	
TRAINING			
TOTAL			

(*Software to be developed using this language, includes test programs.)

4. SCHEDULE IMPACT: Attach present program schedule.

Present Phase of the Acquisition Cycle_____

(If coding has already started, state portion of program completed. Submit samples of coded modules demonstrating the advantages of the chosen HOL.)

Discuss and justify why the use of an appropriate approved HOL for programming mission critical software/TPS will impact the present schedule.

5. MAINTAINING ORGANIZATION COMMENTS AND COORDINATION

SIGNED_____ DATE_____

ORGANIZATION_____

TELEPHONE (commercial)_____ AUTOVON_____

==========

For additional information regarding this waiver request, contractor points of contact are:

FOR	NAME	OFFICE SYMBOL	TELEPHONE
Unit Under Test UUT (ATLAS)			
ATE SYSTEM (ATLAS)			
Proposed Language			
Possible Host System			
Program Control (Schedule/Cost)			
Technical Reasons Analysis			
Life Cycle Cost Comparisons			

7. FOCAL POINT COMMENTS:

_____

_____

_____ AUTOVON _____

8. TECHNICAL CONTROL POINT COMMENTS:

NAME:_____

ORGANIZATION:_____

TELEPHONE:(commercial)_____AUTOVON_____

Figure II-11-3. Instructions on Filling Out A High Order Language Waiver

Project Title: Self explanatory
Organization Procuring the System: (ESD/Buying SPO name)
Organization Which Will Operate the System: (Operating Command (POC))
Organization which Will Monitor the System: (The designated support ALC)

1. Description of the Proposed Hardware Configuration:

   a. Host Target/Control Computer, type, model, etc. (Manufacturer, Model No)
   b. Memory type: (Dynamic RAM, ROM, PROM, Disc)
      Memory size: (Number of Bytes, words, (96KB))
   c. On line system peripherals: (Give specific type of device, e.g. thermal printer, 1000LPM Printer, $5^1/_4$ floppydisc, 10MB winchester Hard Disc, etc)
   d. Known available language processors from manufacturer of other sources (e.g., Fortran, COBOL, etc)
      (Languages supported by the manufacturer or other sources for for this hardware configuration.)
   e. Attach an ATS block diagram and a brief engineering description of the ATS application on a seperate sheet (ATLAS Waiver only).

      (The engineering description should include all physical characteristics, how the unit works basically, whether it is programmable or manual, what software is used, how it is loaded, how the unit interfaces with the UUT, and how the unit interfaces with operator.

      (The ATS block diagram should graphically represent the functional hardware configuration and include signal interfaces between the modules/components (buses).)

2. Proposed Language Software: (Language Name)

   a. Is there a standard for this language? (ANSI, IEEE, DOD) (List the standard available.)
   b. Is there an existing compiler/interpreter for this language? (Give which one and manufacturer)

      1. When developed: (Give original version/date and version to be used/date.)
      2. For which systems: (Give hardware configuration above version presently runs on.)
      3. Who maintains it: (Give name of company.)
      4. Identify required modifications (if necessary): (List any and all necessary modifications required to use this compiler/interpreter on the proposed hardware configuration. Continue on a seperate sheet if necessary.)

c. Identify support software modifications (if required): (List any/all necessary modifications to the support software in order to use it on the proposed hardware configuration. Continue on a seperate sheet if necessary.)

d. List of other known USAF Systems/ATS which use the proposed language:

1. (List any other fielded systems or automated test sets currently in the USAF inventory which uses the proposed language.)
2.
3.
4.

e. List other USAF that interface with this weapon system of the same and other maintenance levels, and the languages used for their software.

System	Language
1.	(Self Explanatory)
2.	
3.	
4.	

3. Technical Evaluation:

a. List Approved HOL problems and show how such problems are solved with the proposed language. Use actual program examples (use seperate pages if necessary).

(Information here should be explicit. Problem definitions should be clear and concise. Examples of code using the proposed language should be given and explained.)

b. Can modifications to an approved HOL, use of external procedures, or the extensibility of the language result in the same solution. Explain why not.

(Answers here should be objective. They should also be more explicit than a "No." If this area is unknown, state "unknown", and the technical feasibility concerning this area will be determined by the ATLAS technical control point.)

4. Life cycle cost comparison: (Use 15 years as the system life.) Attach supporting documentation.

(Entries on this page must be explained fully. Explanation may be given in the comments section or on an attached page if more room is needed. If a software cost model is used, full disclosure of all imput/output data is required. Preferably, a copy of the model's execution run should be attached. Each proposed language should be compared with the appropriate approved HOL on a one-to-one basis. For multiple languages a cost estimate for each language must be submitted.

c. Schedule Impact: Attach present program schedule.
Present Phase of the Acquisition Cycle:

(If program coding has already started, state portion of program completed. Submit samples of coded modules demonstrating the advantages of the the chosen HOL.)

Discuss and justify why the use of an approved HOL for software will impact the present schedule.

(Discuss fully the expected impact and show how using the proposed HOL alleviates the problem.

5. Maintaining Organization Comments and Coordination

(The ALC designated to maintain the hardware/software must coordinate and sign here.)

6. Contractor points of contact for information submitted.

REFERENCES

AIR FORCE REGULATIONS

AFR 57-4	Modification Program Approval	15 Dec 77
AFSC Sup 1	Retrofit Configuration Changes	1 Apr 74
AFR 65-3	Configuration Management	11 Jul 78
AFSC Sup 1	Configuration Management	25 Jul 79
AFR 66-12	Aircraft and Missile Equipment Accountability	15 Aug 79
AFR 70-15	Source Selection Policies and Procedures	16 Apr 80
AFSC Sup 1	Source Selection Policies and Procedures	18 Feb 77
AFR 80-14	Test and Evaluation	12 Sep 80
AFSC Sup 1	Test and Evaluation	19 Feb 81
AFR 80-45	Distribution Statements on Technical Documents	24 Mar 71
AFSC Sup 1	Distribution Statements on Technical Documents	22 May 80
AFR 300-10	Computer Programming Languages	15 Dec 78
AFSC Sup 1	Computer Programming Languages	2 Sep 80
AFR 310-1	*Management of Contractor Data*	30 Jun 69
AFSC Sup 1	Management of Contractor Data	11 Mar 79
AFR 800-2	Acquisition Program Management	14 Nov 77
AFSC Sup 1	Program Management	18 Oct 78
AFR 800-4	Transfer of Program Management Responsibilities	15 Jun 80
AFSC Sup 1	Transfer of Program Management Responsibilities	11 May 76
AFR 800-8	Integrated Logistics Support Plan	7 Feb 80
AFR 800-14, Vol I	Management of Computer Resources in Systems	19 Sep 79
AFSC Sup 1	Management of Computer Resources in Systems	8 Aug 77
AFR 800-14, Vol II	Acquisition and Support Procedures for Computer Resources in Systems	26 Sep 79
AFR 800-19	System or Equipment Turnover	27 May 75
AFR 800-21	Interim Contractor Support for Systems and Equipment	21 Sep 78
AFSC Sup 1	Interim Contractor Support for Systems and Equipment	29 Jan 80

AFSC Regulations & Pamphlets

AFSCR/AFLCR 80-17	Air Force Engineering Responsibility for Systems and Equipment	15 Jul 77
AFSCR 310-1	Management of Contractor Data	11 Mar 74
AFSCR/AFLCR 800-2	Management Multi-Service Systems, Programs, and Projects	4 Sep 73
AFSCP 800-3	A Guide for Program Management	9 Apr 76
AFSCP 800-7	Configuration Management	1 Dec 77

Military Standards & Handbooks

AFSC Design Handbook 4-2	Electronic Systems Test & Evaluation	10 Apr 71
MIL-HDBK-334	Evaluation of a Contractor's Software Quality Assurance Plan	15 Jul 81
MIL-STD-483 and Notice 2	Configuration Management Practices for Systems, Equipment, Munitions, and Computer Programs	31 Dec 70
MIL-STD-490	Specification Practices	30 Oct 68
MIL-STD-1521A	Technical Reviews & Audits for Systems, Equipment, and Computer Programs	1 Jun 76
MIL-STD-1679(NAVY)	Weapon System Software Development	1 Dec 78
MIL-S-52779A	Software Quality Assurance Program Requirements	1 Aug 79

ESD DOCUMENTS

ESD-TR-75-85	ADA016488	An Air Force Guide for Monitoring Software Development Status	Sep 1975
ESD-TR-76-159	ADA027051	An Air Force Guide to Software Documentation Requirements	Jun 1976
ESD-TR-77-16	ADA035924	Statement of Work Preparation	Jan 1977
ESD-TR-77-22	ADA037115	Life Cycle Events	Feb 1977
ESD-TR-77-130	ADA038234	Software Acquisition Management - Software Development and Maintenance Facilities	Apr 1977
ESD-TR-77-254	ADA047308	An Air Force Guide to Computer Program Configuration Management	Aug 1977
ESD-TR-77-255	ADA047318	Software Quality Assurance	Aug 1977
ESD-TR-77-263	ADA048577	Verification	Aug 1977
ESD-TR-77-326	ADA053039	Validation and Certification	Aug 1977
ESD-TR-77-327	ADA053040	Software Maintenance	Oct 1977
ESD-TR-78-117	ADA052567	Reviews and Audits	Nov 1977
ESD-TR-78-139	ADA055573	An Air Force Guide to the Computer Program Development Specification	Mar 1978